GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXXV., No. 3429.] WEDNESDAY, FEBRUARY 6, 1929. [81ST YEAR.

Editorial Notes.

At Shorter Intervals.

SOME weeks ago, with the shadow of quarter day already beginning to dim the sunshine in our path, we ventured to utter a meek protest against the ancient custom of besieging people with accounts at four specified periods of the year. Quarter day—and the worst quarter day of the four—is now past; and were it necessary to re-write that article, while still suffering from the onslaught of creditors, its tone might be not quite so meek. But the article has not to be re-written. In its place we are able to offer to-day something far better than that—namely, details of an actual working example of a monthly gas account system affecting approximately 115,000 ordinary consumers. These details were altogether unknown to us at the time of publication of the article referred to. The system of monthly gas accounts was, it seems, introduced by the South Metropolitan Gas Company last April; and we are this week able to state that experience during the past nine months has proved to be generally popular among consumers in the Company's area. Accounts in this form are, indeed, far more acceptable than the quarterly demand method previously in vogue. The system adopted is a mechanical one; and photographs accompanying our description indicate the character of the special machines installed for dealing with the work. No one connected with the administrative side of a gas undertaking should neglect the opportunity which the "JOURNAL" thus affords of studying the manner in which the Company have solved the difficult problem of the quarterly account.

All, of course, are not situated as are the South Metropolitan Gas Company, who have great numbers of consumers of just that class to whom quarter day may be specially trying. These consumers will be grateful for an introduction which makes things—difficult enough these days, in the best of circumstances—substantially easier for them; and another word for gratitude is goodwill—that elusive, intangible asset, the value of which, though impossible to assess in pounds, shillings, or pence, must be greater than that of any other single factor in a commercial undertaking. Goodwill is much like advertising in respect of the difficulty of tracing direct results. How often does one hear an advertiser remark: "I cannot "trace any inquiries," &c. This is said in all sincerity. Yet the most prosperous businesses are those which advertise to the greatest extent. The advertisement is a silent servant working always for the undertaking which it represents; and precisely the same remark applies to goodwill.

There is, however, still another side to this question of monthly accounts. Even the most innocent among taxpayers must have realized by this time that far less trouble is likely to accrue from the sending out of two six-monthly income-tax demands amounting to (say) £25 each, than would be caused by a yearly one of £50. Carrying the same method of reasoning to the monthly gas account, we would venture the opinion that the consumer will be well able to settle a monthly account which is somewhat larger than one-third of what his quarterly account would have been. If this assumption should prove correct, the result of the change will be to cause greater satisfaction to the customers and also to increase the gas consumption. These gains, together with smaller amounts outstanding, have to be set against any extra cost and trouble incurred. Altogether an enterprising move on the part of the South Metropolitan Gas Company.

We have said that circumstances differ, and like treatment might not suit every case; but where monthly accounts are not practicable, or are not thought advisable, the stereotyped quarterly periods need not necessarily be adopted for the purpose of the three monthly statements.

Accounts of the Gas Light and Coke Company.

THE Report and Accounts of the Gas Light and Coke Company for the past year must have been very pleasant reading for that Company's numerous stockholders. Apart from the material increase of dividend recommended at the rate of £5 12s. p.ct. per annum for the last half of the year as compared with a dividend at the rate of £5 1s. 4d. p.ct. per annum for the corresponding half-year of 1927, the results are particularly satisfactory by reason of the increase in the sales of gas, which were 1·09 p.ct. in excess of the sales for the previous year. What this increase means will perhaps be more fully appreciated when expressed in the number of therms it represents. This quantity, 2,528,480 therms, is greater than the total output of gas of a company of the size and importance of Carlisle.

The accounts for 1927 were adversely affected by the aftermath of the coal stoppage in 1926, so that it was to be expected that last year's figures would show considerable variation in detail, particularly in the cost of coal and the amount realized for residuals.

The gross profit—*i.e.*, the balance carried from the revenue account to the net revenue account—£1,853,520, is £116,531 more than the previous year; and after adding the amount brought forward from the previous year, and providing for the dividend of £5 12s. recommended to be paid for the last half of the year, and the interim dividend and other dividends and interest paid, and the contribution to redemption fund, there remains a balance to be carried forward to the current year of £158,658, against £121,577—an increase of £37,081.

This is an eminently satisfactory result, of which the Directors and Officers must be justly proud, especially as gas has been sold during the whole year at 8·6d. per therm, which is lower than either of the other two Metropolitan Companies—a position which, if our recollection is right,

the Gas Light and Coke Company has never achieved before.

On the capital account it will be seen that the amount expended, *less* depreciation and the amount written off plant, was £521,822, which increases slightly the capital expended per therm.

On the credit side it is seen that £2,000,000 of 5 p.ct. redeemable debenture stock (1952-57) has been issued during the year at the price of £99 p.ct. During the year, £37,000 of ordinary stock and £112,800 6 p.ct. and £28,940 7½ p.ct. mortgages have been redeemed. The coal carbonized has reached the huge total of 2,702,677 tons—a record in the Company's history—costing 20s. 8d. per ton into works, or 10s. 3d. per ton less than for 1927; and nearly 14¾ million galls. of oil were used during the year.

Comparing the principal items of the revenue account with those of the preceding year:

	Gain. £	Loss. £
Coals and oil, &c., cost less by	1,456,753	
Residuals realized less by		251,124
	251,124	
Net coals and oil, &c., cost less by	1,205,629	
Carbonizing wages were less by	14,296	
Repair and maintenance of works and plant were more by		65,611
Distribution cost less by	171,994	
Rent, rates, and taxes were more by		37,466
Management more by		12,345
Expenses Brentford amalgamation —a gain of	112,294	
Other items cost more by		27,002
	1,504,213	142,424
	142,424	
	1,361,789	
Gas, rentals, &c., realized less by	1,245,258	
Balance of revenue account was more by	116,531	
Dividends, debenture, and other interest (paid and received), and contribution to redemption fund were more by		86,380
	86,380	
Leaving a net improvement, as compared with the year 1927, of	£30,151	

but it will be seen that the sum of £50,000 has been carried to the special purposes fund.

Of the variations in expenditure included in the above statement the most noticeable is in the distribution item; the saving being due to the reduction in the cost of repair and renewal of meters and the cost of fitting-up automatic supplies—viz., £166,746 and £32,115 respectively.

There is no item on the balance-sheet which calls for special comment, except that, as explained in the report, in compliance with the assurance given by the Governor to the Chairman of the Select Committee of the House of Commons on the Company's Act of 1926, part of the new capital raised during the year has been vested in Trustees and invested in suitable securities for the benefit of the superannuation and pension funds; and the amounts of these two funds are accordingly reduced.

The progress of the Company's business is clearly indicated by the addition of 27,300 consumers and an increase of 91,353 in the number of stoves sold and let out on hire.

The recent rise on the London Stock Exchange of the Company's ordinary stock, now quoted at 20s.—20s. 6d., shows that the Company's success is fully realized by the public. Transactions have taken place this week at 20s. 6d. per £1 stock.

Accounts of the South Metropolitan Gas Company.

Examination of the accounts of the South Metropolitan Gas Company for the past year reveals the fact that the Company has maintained its reputation for efficiency. In common with the experience of other companies, the sales of gas have been adversely affected by the remarkable climatic conditions that prevailed during the greater part of the year, and there has been a slight decrease of about ½ p.ct. in comparison with the total sales of the preceding year. The sales were augmented by 333,895 therms sold to the South Suburban Gas Company, without which the decrease would have been ½ p.ct.

The capital account shows that there has been considerable extension to buildings, plant and machinery, mains and services, and to district apparatus. The amount expended—£253,095—would appear to be the highest on record. In addition, expenses incurred in the replacement of plant and works—£88,963—have been charged to the special purposes fund. During the year 1927 the expenditure was £103,241 only.

The gross profit for the year—£561,800—shows practically no change from the previous year; and after providing for the dividend recommended to be paid at the same rate as for the previous year—6½ p.ct.—and for the debenture and other interest (*less* dividends received on the Company's holding of South Suburban stock), a net total of £562,747, there remains the small deficit of £947 on the year's working.

	Gain. £	Loss. £
Coals cost less by	470,695	
Residuals realized less by		202,826
	202,826	
Net coals cost less by	267,869	
Carbonizing wages cost more by		12,826
Repair and maintenance of works and plant cost less by	33,249	
Distribution cost less by	41,768	
Management cost more by		18,193
Other items cost less by	388	
	343,274	31,019
Deducting	31,019	
Leaves a net gain on expenditure of	312,255	
Gas and residuals, &c., were less by	312,426	
Leaves a net loss of		171
The dividend recommended *plus* debenture and other interest (*less* South Suburban dividend) is more by		2,010
Leaving a net loss, as compared with the 1927 figures, of		£2,181

The make of gas calculated on the declared calorific value of 560 B.Th.U. per c.ft. was 74·49 therms per ton. Coals cost 19s. 11d. per ton, which is a reduction of no less than 7s. 2d. per ton on the cost during the year 1927. As shown by the accounts, the coke made for sale was 9·66 cwt. per ton of coal carbonized. Tar made was 9·70 galls., and ammoniacal liquor 41·60 galls. The total expenditure, *less* residuals and public lamp repairs, was 7·89d. per therm sold, and the total receipts for gas, rentals, &c., 9·39d. per therm, leaving a balance on the revenue account of 1·50d. per therm.

The dividend recommended, *plus* interest, &c., is represented by the same figure per therm; and the small deficiency—£947—cannot be expressed under three places of decimals of a penny per therm.

Under the powers of the Company's Act of 1928 additional stock costing £134,687 10s. of the South Suburban Gas Company has been acquired, which makes the total invested interest in that Company £634,687 10s.; but no dividend appears to have been received on the additional stock purchased during the year.

One item in the balance-sheet calls for comment—*i.e.*, the lower amount (£494,901 19s. 8d.) outstanding in respect of the accounts due to the Company for the gas, and for meter, stove, and fire rentals. This figure is exceptionally low in comparison with the previous year. The amount then outstanding was £598,879, and after allowing for the lower price and the slight reduction in sales a comparable amount would be approximately £565,000. The reduction is due, of course, to the Company's new system of monthly collections which has been in force for about nine months; and it would appear that even in this short time it has proved of advantage from a financial point of view.

The Company refer in their report to the agreement that has been entered into with Low-Temperature Carbonisation, Ltd., whereby plant for the production of "Coalite" on a large scale is to be installed at West Greenwich, and state that another plant for the manufacture of low-temperature fuel is being erected at East Greenwich by Coal Oil Extraction, Ltd. It will therefore be possible to try-out the relative merits of the two processes.

The number of consumers has been increased by 3925.

The Industry and the Fair.

WHAT to do and what to see at the forthcoming British Industries Fair at Castle Bromwich, Birmingham, are indicated in to-day's issue of the "JOURNAL;" for we are able to publish a plan of the Gas Section (with the names and positions of the firms who will be exhibiting), and also the programmes which have been arranged for the three days' Joint Gas Conference and the Annual Meeting of Gas Salesmen, together with particulars of the invitation to Industrial Salesmen. All accounts which have been received go to show that the Committee who (with Mr. R. J. Rogers as Hon. Secretary) have been responsible for the organization of the special Gas Industries Section will have every claim to congratulation on the results of their labours. Work on the erection and fitting-up of the various stands is already well advanced; and the Press view on Friday, Feb. 15, should see the Gas Section completed and equipped—a striking example to the assembled Press representatives from all over the country of the progressive spirit which permeates our industry. Those whose wish it was to see gas occupying its just position in this great national Fair will this year have their desire fulfilled; for the exhibits which are being staged will be fully representative of all sections of the industry's activities. Whatever other industry may be overlooked by visiting buyers, the Gas Section will not be missed by even the most cursory survey of the Fair.

The Joint Gas Conference (the Hon. Secretary of which is Mr. H. C. Smith, of Tottenham) promises to be a great success. The subject of each of the three days' proceedings is to be introduced by a master; and the occasion is one which will offer unique opportunities for interchange of opinions. "Come to the Fair!"

Sixth Annual Meeting of Gas Salesmen.

THE British Commercial Gas Association have selected Birmingham as the venue of the Sixth Annual Meeting of members of the Salesmen's Circles; and a visit to the Gas Industries Section of the British Industries Fair forms part of the very interesting programme arranged for the meeting, as reported on a later page of this issue. The good work which the Salesmen's Circles have accomplished is reflected in the enthusiasm of the members in all parts of the country, and, of course, has been made possible largely by the sympathetic co-operation of gas engineers and managers in providing facilities for salesmen to attend the various meetings which are held each year. The fact that the Gas Industries Section of the Fair is a display of all that is latest and best in the way of gas plant and appliances, is in itself sufficient reason for the continuance of that sympathetic co-operation; and we hope that the attendance of salesmen on Feb. 27 will surpass all previous records.

Advances in Vertical Carbonization.

AN excellent paper was presented by Mr. T. A. Harvey, O.B.E., of the Birmingham Gas Department, to the Midland Junior Gas Association last Thursday, and the major portion of it is reproduced in this issue. The contribution deals solely with one of the most modern and most interesting installations of Woodall-Duckham continuous vertical retorts in this country—that at the Saltley Gas-Works. Flexibility of the plant as regards calorific value, gas output, and types of coal which can be treated was one of the major considerations which finally resulted in the Birmingham Gas Committee's decision to instal this unit—though it is only fair to mention that this decision was not a plunge in the dark, for already nearly 3000 tons of coal per day is being carbonized in eight "W-D" installations in the various gas-works in Birmingham.

The particular plant under review, which was put to work only a few months ago, has several unusual features. One is the generation of producer gas in outside units designed to operate on screened coke breeze. There are two batteries of the step-grate type, each consisting of five units, and the gas is led into a common distributing main which extends the whole length of the retort bench. So good is the insulation of this main that the gas—free from dust—enters the retort setting at a temperature *circa* 850° C. The producers lend themselves to great accuracy of control and flexibility of working. When making a gas of 475 B.Th.U. per c.ft., and taking into account the steam generated by the waste gases leaving the setting, the net fuel consumption amounts to only 5 p.ct. of the weight of coal carbonized—a remarkable achievement.

Another unusual feature of the installation is the coal handling and blending plant, by means of which it is possible to deliver a uniform mixture of coals to the bunker feeding the battery of retorts. This system ensures threefold uniformity: That of the coke produced—which factor, as we have emphasized previously in these columns, is of primary importance in the development of coke sales—that of the gas; and that of the breeze employed in the producers. This uniformity, which is a definite advance in gas-works practice, spells economy and efficiency in working, will undoubtedly reduce maintenance charges, and offers many opportunities in the manufacture of cokes particularly suitable for specific purposes.

A further outstanding feature of the plant lies in the output of gas which can be secured on a given ground area. In this respect, says the author, "the new installation is an advance over any previous plant built in Birmingham." Actually the new plant, which has a capacity of 7 million c.ft. of gas per day, could have been installed on the site of the dismantled beds of inclined retorts, which were capable of turning out only 1¼ million c.ft. In this particular instance, Mr. Harvey explains, ground area was not the supreme factor; and plenty of free space was allowed. Even so, the output of the "W-D" verticals is three times that of the old retort house. The author sums up his paper in a single sentence: "The working of the "new plant has fulfilled expectations." And knowing the part which science and economics have long played in the conduct of the Birmingham Gas Department, our readers will rightly assess this statement.

Australia and England: A Contrast.

THOUGH fundamentally alike, certain conditions obtaining in the gas industry of Australia temporarily afford a striking contrast to those operating in Great Britain. This is the first impression gained by reading the Presidential Address of Mr. R. G. Parsons, who is Manager of the Footscray Works of the Colonial Gas Association, before the Australian Gas Institute—*vide* later pages of the "JOURNAL" to-day. And this impression lends added strength to our belief, which has been expressed on more than one occasion in these columns, that in the long run the cheapest gas-making plant is that which is most flexible—whether it comprises two units, such as horizontal retorts combined with water gas plant, or is a one-stage process, such as the intermittent or continuous vertical retort or chamber. Provided there is flexibility, changes in the market values of the bye-products can be faced with a degree of equanimity impossible if all one's eggs are in one basket.

The first contrast which strikes one lies in the sulphate of ammonia market. Regarding this, the current state of affairs in this country is not riotously happy; and only co-operative effort and centralized working, it seems, can effect an improvement. At present in Australia, the prospects are much brighter. Two years ago the outlook for sulphate was by no means promising. To-day—thanks largely to the activities of the Australian Sulphate of Ammonia Propaganda Committee, and to the general adoption of the manufacture of neutral salt—local demand practically exceeds local production. There is, however, a cloud on the horizon: Imperial Chemical Industries, who are now producing by the fixation of atmospheric nitrogen 250,000 tons of sulphate per annum in Great Britain, are considering the establishment of a synthetic ammonia plant in Australia.

A second contrast relates to tar; and Mr. Parsons' remarks on this subject are—up to a point—depressing. He observes that the adoption of the vertical retort has resulted in the production of more tar, which, however,

without special treatment is not so satisfactory for road surfacing and construction as are straight-distilled horizontal tars. Yet, on the whole, the proportion of vertical-retort tars converted into road tars in England probably reaches 60 p.ct. of the total output; and it is a fact that straight distillation up to definite points in the majority of cases results in the production of residue tars which conform to the Ministry of Transport (Road Department) Specifications 3 (*a*) and 3 (*b*) for Road Tars No. 1 and No. 2. Of the coal carbonized in Great Britain at the present time, practically 50 p.ct. is treated in vertical retorts of various types. At the same time, the employment of tar on our roads is increasing apace. It is estimated that, in 1923, 450,000 tons were sold for this purpose; the corresponding figure for 1927 was 700,000 tons—an increase of 55 p.ct. for the five years. The importation of bitumen in the same years amounted to 262,871 and 260,640 tons respectively. Turning to Australia, one finds that there is an increasing demand for bitumen as a road binder. During the last two years the value of the imports of this product has more than doubled. The remedy, we suggest, lies in the exercise of greater co-operation between producers of tar and the highway authorities; the formation of some organization similar to our own British Road Tar Association (which, though of recent birth, has already accomplished much); constant vigilance and care in supplying only such tars as are proved to be satisfactory; and, finally, educational work regarding their correct application.

Coke provides a third contrast. At one time consumers found gas-works coke difficult to obtain in Australia; to-day most gas companies find difficulty in placing their output. This is the outcome of competition from the brown coal briquette, which is now produced in large quantities and sold cheaply. Nor is this competition decreasing. The State Electricity Commission sold 121,957 tons of brown coal briquettes during the year ended June last; and they now have in hand extensions to their plant which will produce an additional 200,000 tons per annum—a fact which lends point to our contention that flexibility is one of the most valuable characteristics of any gas-making plant.

Not only is it desirable to face facts; it is essential. And nothing but admiration can be felt regarding the outlook of Mr. Parsons. His address is neither a panegyric nor a melancholy disparagement. He states boldly that the gas industry of Australia has a great future ahead of it rather than a past behind it; and, considering that during the past thirteen years sales of gas have increased by over 115 p.ct., there is ample justification for this statement. At the same time he is rightly anxious that all responsible for the development of the industry should appreciate in their true proportion the difficulties which may have to be faced and overcome; and—provided the potentialities of gas service are fully exploited—it is certain that these difficulties will be surmounted, and that the industry will go on from strength to strength.

Short-Wave Radiant Energy.

The beneficial effect of short-wave radiant energy was the subject of a letter by Prof. Leonard Hill—whose researches on the therapeutic value of different forms of radiant energy are well known—to "The Times" of Jan. 29. A lengthy extract of this letter appears in our "Miscellaneous News" to-day; and it explains in lucid manner the advance in gas heating which has been made by Radiation Ltd., in their production of the "Thermo XX Beam" radiant. The latter was fully described in the "JOURNAL" for Nov. 28 last, p. 600.

Institution Medals for Papers of Merit.

Speaking at the Annual Dinner and Concert of the London and Southern District Junior Gas Association last Friday, Mr. John Terrace, M.Inst.C.E., the President of the Institution of Gas Engineers, referred to the Institution's decision—reported in the "JOURNAL" for Dec. 19, 1928—to award the Bronze Medal for a paper of sufficient merit submitted at the meetings of the Junior Associations. This practical expression of help and co-operation is certain to encourage the junior members of the gas profession to still greater efforts to increase their own status and to accelerate the rate of progress of the industry. Needless to say, the remarks of Mr. Terrace last Friday were enthusiastically received.

The Proposed National Industrial Council.

A serious position has arisen in connection with what is now known as the Melchett-Turner Conference on Industrial Re-organization and Industrial Relations. An interim report issued last July announced that it had been agreed that it was desirable, for the continuous improvement of industrial re-organization and industrial relations, that a National Industrial Council should be formed, and that the necessary steps for its formation should be taken immediately. It was recommended that the composition of this Council should be as follows: (*a*) The representatives of the workers should be the members of the General Council of the Trades Union Congress. (*b*) An equal number of representatives of the employers should be nominated by the Federation of British Industries and the National Confederation of Employers' Organizations. It was agreed that the three main functions of the National Industrial Council should be: (1) To hold regular meetings once a quarter for general consultation on the widest questions concerning industry and industrial progress. (2) To establish a Standing Joint Committee for the appointment of Joint Conciliation Boards. (3) To establish and direct machinery for continuous investigation into industrial problems.

Some Objections to the Lines Specified.

Now there has been issued a reasoned statement of the objections raised by the British Engineers' Association to the formation of a National Industrial Council on the lines specified in the report just referred to. In the first place, it is remarked that the General Council of the Trades Union Congress directly represents less than 4,000,000 out of the 12,000,000 insured persons engaged in industry and trade. Non-union labour and the unaffiliated trades unions would have no voice on the proposed Council. What is regarded as even more important is that the very brains of industry—the management, the technical staff, those in charge of procuring business, and other salaried staff employees—are apparently to have no opportunity of contributing their great knowledge, experience, and wisdom to the deliberations of the Council. Lastly, we arrive at the most serious obstacle of all—the political one. The British Engineers' Association point out that the Trades Union Congress is a "politically-minded" body, committed to a declared political policy to which the overwhelming majority of industrial employers and responsible men engaged in commerce, shipping, and finance are inevitably opposed. The Association are very sceptical as to the constructive possibilities of a National Industrial Council "composed of two parties whose policies are fundamentally opposed;" and they hold that the proposed Council would be foredoomed to failure "unless the General Council of the Trades Union Congress publicly repudiated the Socialist policy and programme of the Labour Party."

PERSONAL.

We are gratified to read in the current issue of the Co-Partners' Magazine of the Gas Light and Coke Company that Mr. R. W. FOOT has been appointed General Manager of the Company.

To celebrate his recent marriage, Mr. ERIC J. CLARKE, Chairman of the Leeds Corporation Gas Committee, has been presented with a portable wireless set by the employees of the Gas Department. Mr. C. S. Shapley, the City Gas Engineer and General Manager, handed over the gift.

Mr. W. PARKER, M.Inst.C.E., M.I.E.E., late Sales Manager to British Furnaces, Ltd., has joined the staff of Premix Gas Plants, Ltd., York Mansions, Petty France, S.W. 1, as their Sales Engineer.

Mr. R. J. BRADSHAW, of the Blackpool Gas Department, has been appointed Assistant Gas Engineer and Manager to the Macclesfield Corporation, and commenced his new duties on Jan. 24.

Mr. W. OLDHAM, of Accrington, has been appointed Technical Assistant at the Ellesmere Port Gas-Works.

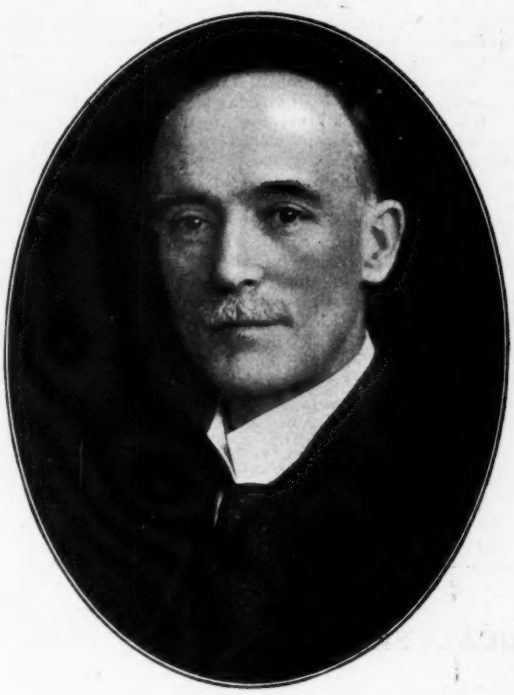
OBITUARY.

LEONARD ASKEW.

In our issue last week we announced the regretted death of Mr. Leonard Askew, which took place, on Jan. 26, from an attack of pneumonia which he had contracted only a few days previously.

The funeral, at Streatham Park Cemetery last Wednesday, was attended by a large number of friends of the deceased and of his family; several of them coming from long distances in order to pay their final tribute of respect to one who was held in high estimation both in private and in business life.

Mr. Askew was born at Rotherham in the year 1863, and his early engineering training was obtained at the Parkgate Ironworks. After filling various positions, he came south, in 1885, as Assistant to Mr. A. F. Phillips, M.Inst.C.E., who was then in practice at St. Albans, but who shortly afterwards moved to Westminster, where he built up an important consultant's business. From that date until Mr. Phillips died in 1924, Mr. Askew was associated with him in his extensive work in gas, water, and general civil engineering projects. After Mr. Phillips' death, Mr. Askew continued the practice, and was carrying on in full vigour until suddenly stricken with his fatal illness.



During the long period of over forty years he had been concerned in the design and construction of numberless works in this country, in many European countries, in the near East, in the Far East, in South America, and in other places. In carrying out this work he had travelled extensively in many parts of the world.

Mr. Askew acted as Consulting Engineer to a number of public utility companies and concerns abroad, and to gas and water companies in Great Britain. He was Engineer and Secretary to the Tuscan Gas Company, who own works in various parts of Italy, and was in the habit of visiting them once or twice every year. He was also on the Boards of Directors of several gas and other companies, and was a member of both the Institution of Gas Engineers, to which he was elected in 1921, and the Institution of Water Engineers.

Mr. Askew leaves a widow and one son, Mr. Royston Askew, Assoc.M.Inst.C.E.

The death occurred on Wednesday last, Jan. 30, of Mr. THOMAS FRIZELLE, who for over forty years was Engineer and Manager of the Holywood Gas Company, Co. Down. Deceased was a member of the Institution of Gas Engineers, and was the only member of the Irish Association of Gas Managers who had occupied the position of President on two separate occasions. A man of great talent, who was ever ready to give advice to those who came to seek it, he will be greatly missed. The funeral was attended by many members of the Irish Association of Gas Managers.

EVENING STAR LODGE LADIES' NIGHT.

Mrs. CROAGER and W.Bro. ARTHUR L. CROAGER, Worshipful Master of the Evening Star Lodge, No. 1719, who presided over the banquet and other festivities at the Evening Star Ladies' Night. W.Bro. Croager, who is a Past Master of the Lullingstone Lodge, No. 1837, joined the Evening Star Lodge in 1915, passed through the successive offices, and was installed as Worshipful Master in March last; thus following in the footsteps of his father, W.Bro. Arthur E. Croager, who occupied the chair in 1915, and now holds the office of Treasurer.

FORTHCOMING ENGAGEMENTS.

Feb. 9.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Meeting in the Royal Technical College, Glasgow.

Feb. 12.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board.

Feb. 12.—FEDERATION OF GAS EMPLOYERS.—Meeting of Central Committee.

Feb. 16.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Cardiff. Paper by Mr. T. H. Madden.

Feb. 16.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Bradford. Paper by Mr. E. R. B. French, of Leeds, on "Water Heating Problems."

Feb. 19.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meetings of the Executive Committee and the General Committee, in Birmingham.

Feb. 19, 20, 21.—BRITISH INDUSTRIES FAIR.—Joint Conference under the auspices of the National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association, and the Society of British Gas Industries.

Feb. 23.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. J. G. Stein & Co., Ltd.

Feb. 25.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of the Finance Committee, in London.

Feb. 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

Feb. 28.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the British Industries Fair, Castle Bromwich.

Feb. 28.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

March 5.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of the Lancashire Section of the Manchester District, in Manchester.

March 15.—SOUTHERN ASSOCIATION. Hotel Cecil. 2.15 p.m.

INSTITUTION OF GAS ENGINEERS.

Feb. 12.—Gas Education Executive Committee, 4 p.m.

Feb. 13.—Executive Committee, 10.30 a.m.; Finance Committee, 11.30 a.m.; Benevolent Fund Committee, 12 noon; Berlin Visit Committee, 2 p.m.; Council Meeting, 2.30 p.m.

GAS LIGHT AND COKE COMPANY.

Report of the Directors.

The following is the report of the Directors which will be submitted to the proprietors at the general meeting of the Company on Friday next.

The accounts for the year [that is, to Dec. 31, 1928] show that, after paying in respect of the June half-year dividends at the rate of 4 p.ct per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and 5½ p.ct. per annum on the ordinary stock, and after contributing the sum of £20,000 to the redemption fund, there is a total available balance of £830,099 13s. 8d., out of which the Directors recommend the payment of the following dividends in respect of the December half-year: On the 4 p.ct. preference stock at the rate of 4 p.ct. per annum, on the 3½ p.ct. maximum stock at the rate of 3½ p.ct. per annum, and on the ordinary stock at the rate of £5 12s. p.ct. per annum, which, together with the further sum of £20,000 to be contributed to the redemption fund, will absorb £671,441 16s. 10d. and will leave £158,657 16s. 10d. to be carried forward to the credit of the current year.

The sale of gas during the past year shows an increase of just over 1 p.ct. There has been an addition for the year to the number of the Company's consumers of 27,300, and an increase of 91,353 in the number of gas stoves sold and let out on hire.

A Bill in Parliament has been deposited to provide for the transfer to the Company of the undertakings of the Grays and Tilbury Gas Company and the Pinner Gas Company, Ltd., to confer various powers upon the Company, and for other purposes. The Clauses of the Bill will be explained to the proprietors when, in compliance with standing orders, it is submitted for their approval at an extraordinary meeting which will be held immediately after the close of the ordinary general meeting on Feb. 8.

A serious explosion occurred in Holborn on Dec. 20. The cause of this is now forming the subject of an inquiry by Commissioners appointed by the Home Secretary.

In compliance with the assurance given by the Governor to the Chairman of the Select Committee of the House of Commons on the Company's Act of 1926, part of the new capital raised during the year has been vested in Trustees and invested in suitable securities for the benefit of the officers' superannuation, and co-partners' (non-staff) pension, funds. The amounts of these two funds deposited with the Company as shown in the general balance-sheet are accordingly reduced.

DAVID MILNE-WATSON,

Governor.

SOUTH METROPOLITAN GAS COMPANY.

Report of the Directors.

The following is the report of the Directors for the year ended Dec. 31, 1928, which will be presented to the proprietors at the general meeting next Wednesday.

Notwithstanding an addition of 3925 to the number of consumers, the gas sold shows a slight decrease—namely, 0·52 p.ct. This has been largely due to the mild weather which prevailed during the latter part of the year; and it has been already more than overtaken. The system of rendering gas accounts at monthly instead of quarterly intervals has been well received by the consumers. While substantially lower prices have been paid for coal, the lower value has been reflected in the reduced returns from bye-products, for all of which prices have fallen. The cost of plant repairs and renewals has been again heavy. Much of this outlay has been incurred in respect of gasholder and purifier replacements which may be expected to be effective for many years.

The main required to deliver gas in bulk to the South Suburban Gas Company has been completed and put to work. Gas from the East Greenwich Works is now available throughout that Company's district.

The Bill authorized by the proprietors at the extraordinary meeting in February last received the Royal Assent on July 2. By it, the capital powers of the undertaking have been increased by two million pounds.

An agreement has been entered into with Low Temperature Carbonisation, Ltd., whereby plant for the production of "Coalite" on a large scale will be installed at West Greenwich. Another plant for the manufacture of low temperature fuel is being erected at East Greenwich by Coal Oil Extraction, Ltd. It will be possible, therefore, to try out the relative merits of two typical processes, as well as to test the markets for the resultant products.

The payment is recommended of a dividend at the rate of 6¼ p.ct. per annum *less* the 2½ p.ct. interim dividend. Consequent upon this will be the allocation of £82,624 to the Employees' Co-Partnership Fund. The co-partnership continues its important task. Much has also been accomplished in the way of adjusting labour requirements to present day conditions.

Owing to the regretted retirement by reason of ill-health of Mr. E. Honoratus Lloyd, K.C., the Board appointed in his place Dr. E. Frankland Armstrong, F.R.S. Two Directors, Mr. Frederick McLeod and Dr. Armstrong, and one Auditor, Mr. John H. Fry, retire by rotation, and, being eligible, offer themselves for re-election. Mr. Joseph D. Payne has been elected an Employee Director in place of Mr. Henry Frost.

CHARLES CARPENTER,

President.

ON THE ELECTRICAL SIDE.

Advertising Value of Outside Lighting.

Only a fortnight ago, in our editorial columns, we remarked upon the fact that public lighting contracts, while frequently unprofitable from the point of view of immediate financial return, cannot fail to be of substantial advertising value; and we urged that for this reason, if for no other, the contract for street lighting should be retained wherever possible. One frequently sees and hears reference made to the outstanding examples of street gas lighting to be found both here and on the Continent; but there are also innumerable installations on a smaller scale which deserve their share of commendation. What is known as "parade lighting," serving a series of shops, is an extremely effective means of demonstrating the efficacy of gas for outside illumination of this character; and it is a plan of which enterprising gas undertakings have taken advantage to a considerable extent. From time to time attention has been drawn by us to installations of this character; and it will be a pleasure to illustrate, either in the "JOURNAL" or in the "GAS SALESMAN," other similar work, of which readers may be kind enough to furnish information and photographs.

That we are not peculiar in placing upon such lighting so great an estimate of value from the advertising point of view is evidenced by the fact that our contemporary "Electricity" has on more than one occasion recently referred to the prevalence of high-pressure gas for outside shop lighting in certain districts in the outer London area; and the latest issue of that paper contains the following comment: "From the point of view of load factor, outside lighting compares favourably with occasional domestic heating, and as regards the cost of production theory there is no reason why the charge for the one should exceed the charge for the other. There is, however, a vital difference in the advertising value of the two uses. From this point of view, the domestic supply has a very small bearing on future development; but the appeal of ample outside shop lighting must be very forcible. Nothing can appear to be a greater witness to the inferiority of electricity—as alleged by some people—in the lighting field than the general use of high-pressure gas in a shopping locality; and there appears to be every reason for supplies for outside lighting to be offered at rates which are more favourable than any other."

The writer of the article in question thinks that the question of outside lighting is, with the business consumer, almost entirely a matter of tariffs; and that where a two-part tariff is in use, with a unit charge which is the same for shops as for private houses, it will generally be found that electricity is freely used for outside shop lighting. Without altogether assenting to the theory that the use of electricity for outside lighting is almost entirely a matter of tariffs, we feel there is a good deal of force in the statement that, under a two-part tariff, "in the field of outside lighting, it would almost pay the undertaking to remit the unit charge altogether, provided the appropriate standing charge were met."

Taking No Chances.

The electricians are always telling us of the unrivalled advantages of that which they have to sell, and this is perhaps only natural. It may be that "good wine needs no bush;" but electricity requires a deal of pushing. Some things "sell themselves;" not so electricity. Unrivalled advantages are all very well in their way, but a little bolstering-up is not to be

despised, evidently. Hence we come across such an amazing state of affairs as is revealed by the following cutting from the "Dundalk Democrat," referring to a meeting of the Electricity Committee of the Urban District Council: "The Engineer submitted correspondence with the Great Northern Railway Company on the subject of electric lighting installations at the Company's local houses under the Assisted Wiring Scheme, and asking for consent to erect poles on the Company's property for the purpose of conveying current from the existing overhead mains to the houses. The Company had been notified that, notwithstanding consent to the erection of the poles being obtained, the proposal would not be carried out unless there was a fairly unanimous demand received from the tenants, and that the latter would agree to the removal of the existing gas lighting fittings as and when electric light was connected. No definite reply on the matter had yet been received from the Company. The Engineer added that he was arranging to have the tenants canvassed at an early date, and would report developments at the next meeting. There were 52 houses in all, and so far only fourteen applications under the Assisted Wiring Scheme had been received."

The terror lest these fourteen might subsequently change their minds is understandable: but the method adopted to provide against such a contingency is ludicrous. Take away their gas fittings, so that it must be electricity or nothing! This is in an age when everybody prates about the liberty of the subject, and at a time when (we understand) far-famed overhead transmission lines are to bring electricity to the threshold of the humblest home. Prospective customers might ask if they will be permitted to retain their furniture. Some of the housing estates in England will have to look to their laurels.

"Penny-in-the-Slot" Electricity.

The Wrexham Town Council are possessed of a laudable desire to supply current to every house in the borough; and to this end they have adopted a scheme by which any householder may have an installation of electric light, and pay for it with pennies in the slot. After the Corporation have wired the premises and supplied the fittings through local firms, all the consumer will have to do to get his light or heat is to put 8d. in the slot meter. Of this amount, 2d. will be in respect of deferred payments on the hire-purchase system; and the rest pays for the current. When the consumer has used 800 units, the ordinary lighting rate for slot meters generally will be charged. It is estimated by the Council's electrical engineer that in the course of twelve months 400 new consumers will be obtained by the provision of these facilities.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later pages.]

ALTHOUGH monetary uncertainties caused a somewhat heavy atmosphere on the Stock Exchange last week, the investment market was the most active; the speculative sections being adversely affected by the arrangement of carry-over preliminaries. War Loan was again the exception among the gilt-edged stocks, and maintained its strength. Home Rails were neglected, and the results of the various companies for the past year are anxiously awaited.

The Gas Market was quite animated; the stocks of the Continental companies being again the most prominent. European £10 shares moved up 4½ points to 15-17; and Imperial Continental stock made a sensational advance of a further 70 points to 340-360. Continental Union, however, eased off 4 points to 118-123 for both the ordinary and 7 p.ct. preference. Among the dividend announcements for the half-year to December last are: Commercial ordinary at the rate of £7 p.ct. per annum (no change), and Tottenham ordinary at the rate of £6 12s. 6d. p.ct. per annum (7s. 6d. p.ct. per annum increase). Wandsworth ordinary stocks will receive an increase at the rate of 5s. p.ct. per annum, with the exception of the "C" and New stocks, in respect of which the increase is 3s. 6d. p.ct. per annum.

The following transactions were recorded during the week:

On Monday, Aldershot 4 p.ct. pref. 74¾, Alliance and Dublin 100, Bombay 22s., Continental Union 121, 122½, 123, European 12⅞, 13, 13⅛, 13⅜, 14, 14⅛, 14½, 15, 15⅛, Gas Light and Coke 19s. 6d., 19s. 7½d., 19s. 9d., 19s. 9¾d., 19s. 10½d., 3½ p.ct. 65⅛, 4 p.ct. pref. 80½, 3 p.ct. deb. 60¾, 5 p.ct. deb. 101, Imperial Continental 275, 277½, 278, 279, 280, 280½, 281, 282, 285, 286, 287, 288, 289, 290, 291⅛, Primitiva 26s. 7½d., 26s. 9d., 27s., 4 p.ct. 1st deb. 92½, South Metropolitan 108, 108¼, 108¾, 6 p.ct. pref. 112, Tottenham 103, 4 p.ct. deb. 77. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 101, Hemel Hempstead new "C" 107, 107½, Liverpool 5 p.ct. 91½, South Suburban 7 p.ct. deb. 100.

On Tuesday, Alliance and Dublin 101, Bombay 21s. 6d., Bournemouth "B" 12⅝, 4 p.ct. deb. 76, 77, Brighton and Hove 6 p.ct. 117, Bristol 93½, British 118, Cape Town 4½ p.ct. deb. 76, Colombo 7 p.ct. pref. 23s., Continental Union 118½, 119, 120, 121, European 12¼, 15, 15⅛, 15⅜, 15½, Gas Light and Coke 19s. 7½d., 19s. 9d., 19s. 9¾d., 19s. 10½d., 3½ p.ct. max. 65, 4 p.ct. pref. 80, 80¼, 81, 5 p.ct. deb. 101, Imperial Continental 293, 295, 296, 297, 298, 299, 300, 300½, 301, 301½, 302, Primitiva 26s. 4½d., 26s. 6d., 26s. 7½d., 26s. 10½d., 4 p.ct. con. deb. 79, South Metropolitan 108⅞, 109, South Suburban 5 p.ct. 110¾, Tottenham 3½ p.ct. 103, 5½ p.ct. pref. 93. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 101, Hemel Hempstead new "C" 107, 107½, Tottenham 5 p.ct. pref. 93, Watford "B" 94.

On Wednesday, Aldershot 4 p.ct. pref. 76, Alliance and Dublin 101, 101¼, European 14½, 15, 15⅛, 15⅜, 15½, £15 11s., 15⅝, 15¾, 16, 16¼, 17, Gas Light and Coke 19s. 10½d., 20s., 21s. 1½d., 20s. 3d., 20s. 4½d., 3½ p.ct. 65½, 4 p.ct. pref. 80¼, 80½, 3 p.ct. deb. 60¼, 5 p.ct. deb. 99½, 101, Imperial Continental 300, 303, 303½, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 317, 318, Metropolitan (of Melbourne) 5½ p.ct. deb. 101¼, Primitiva 26s. 4½d., 26s. 9d., 26s. 10½d., 4 p.ct. 1st deb. 95½, 4 p.ct. con. deb. 80, South Metropolitan 108¼, 109, 109½, 110, Tuscan 30s., Wandsworth "B" 116. Supplementary prices, Bristol 5 p.ct. new deb. 95½, Cape Town 5 p.ct. deb. 76, Liverpool 5 p.ct. 91.

On Thursday, Alliance and Dublin 101, Brighton and Hove 5 p.ct. 103½, Continental Union 118½, 121, 7 p.ct. pref. 118½, Croydon sliding-scale 112, max. div. 86, European £15 6s. 6d., 16¼, 16⅜, 16½, 16⅞, Gas Light and Coke 20s. 1½d., 20s. 3d., 20s. 4½d., 20s. 6d., 3½ p.ct. max. 65½, 66½, 5 p.ct. deb. 101, Imperial Continental 315, 316, 316½, 317, 318, 318½, 319, 319½, 320, 321, 322¼, 323, 324, 325, 326, 326½, 327, 327½, 328, 330, 331, 332, 333, 335, Primitiva 26s. 1½d., 26s. 3d., 26s. 6d., 26s. 7½d., 26s. 9d., 27s., Tuscan 22s. 6d., Wandsworth 3 p.ct. deb. 57½. Supplementary prices, Harrogate 5 p.ct. deb. 99, Hemel Hempstead new "C" 107, 107½, Liverpool 5 p.ct. 91½, Northampton 6 p.ct. deb. 102.

On Friday, Aldershot 75, 75½, 76¼, 4 p.ct. pref. 74¾, Bombay 22s., Bournemouth 5 p.ct. 13, 7 p.ct. 12½, Brighton and Hove 5 p.ct. 104, Colombo 37s., Colonial 24s. 9d., 8 p.ct. pref. 22s. 3d., Commercial 100, 100½, 101½, 3 p.ct. deb. 58, Continental Union 117, 118, 119½, 7 p.ct. pref. 120, European 16¼, 16⅜, 16½, 16⅝, 16¾, 16⅞, 17, Gas Light and Coke 20s. 1½d., 20s. 3d., 20s. 3¾d., 20s. 6d., 3½ p.ct. 66, 66½, 3 p.ct. deb. 60½, 5 p.ct. deb. 101, Hong Kong and China 13½, Imperial Continental 330, 333, 335, 337, 337½, 338, 339½, 340, 342, 343, 345, 346, 347, 347½, 348, 349, 349½, 350, 350½, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 363, 365, Malta and Mediterranean, 5 8/12, Newcastle 3½ p.ct. 17s. 6d., Ottoman 5s., Primitiva 27s. 3d., 27s. 4½d., 27s. 6d., 27s. 9d., 27s. 10½d., 28s. 3d., South Metropolitan 3 p.ct. deb. 60, 6½ p.ct. deb. 102, Swansea 6½ p.ct. deb. 100. Supplementary prices, Aldershot new 4 p.ct. pref. 74¾, Bristol 4 p.ct. deb. 73, Hemel Hempstead new "C" 107, 107½.

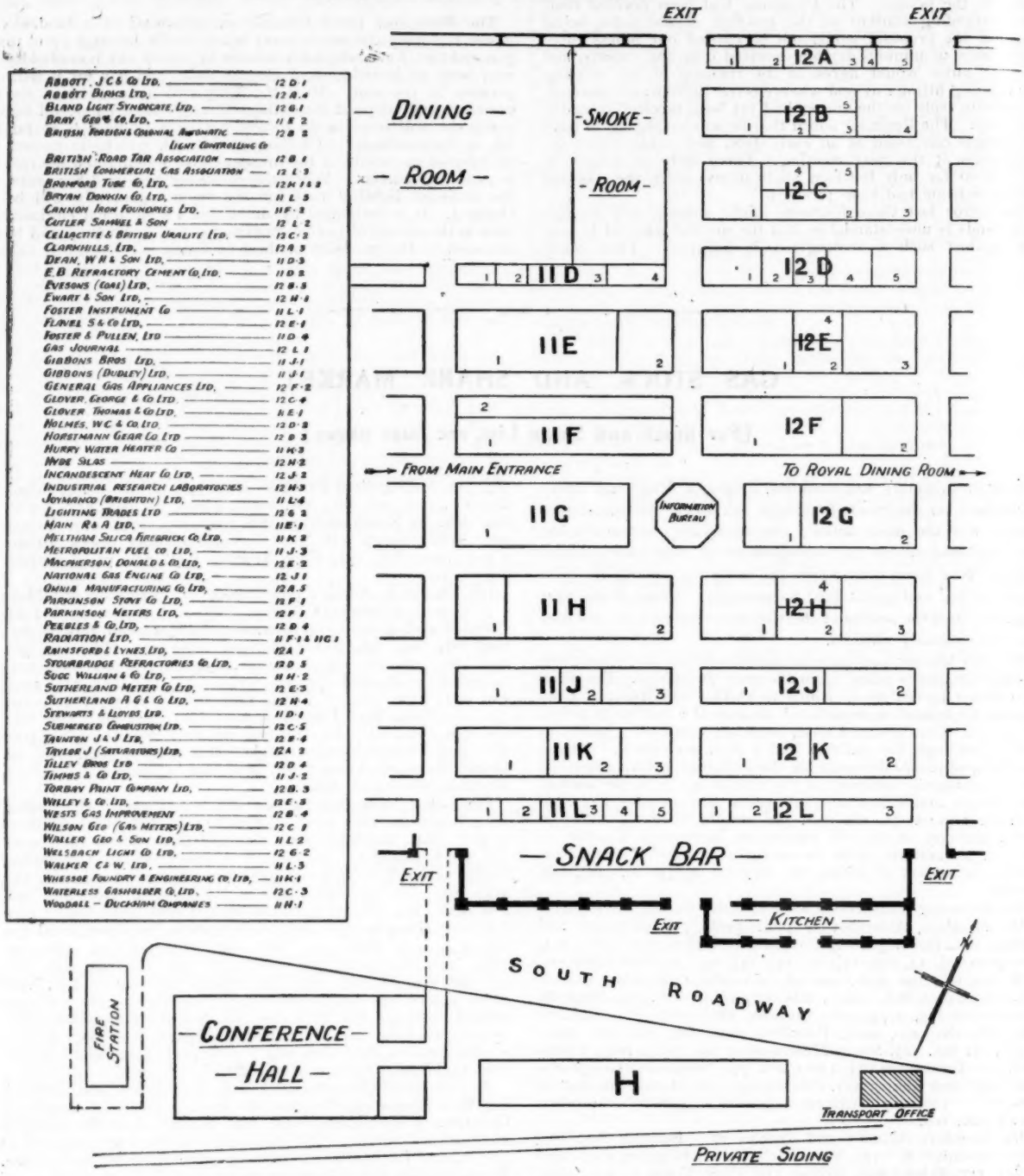
As a result of the repayment of the balances of the outstanding War Bonds and Treasury Bonds and the disbursement of Government dividends, there was a glut of credit available in Lombard Street. Old day-to-day loans were renewed at 3 p.ct., and for new loans balances were ultimately unlendable. Treasury Bills were allotted at an average of £4 5s. 2·83d. p.ct., or nearly 1s. 3d. p.ct. below the previous week's rate, and Discount rates were easier in consequence.

In the Foreign Exchange Market, Sterling showed some signs of recovering, and the quotation on New York closed at 4.84⅞. Among European currencies Spanish pesetas were the most active, and, after fluctuating somewhat, closed at 30.40—a fall of .185. German reichsmarks recovered to 20.41¾, and Dutch florins to 12.10 7/16. Belgas were unchanged at 34.89; French francs at 124.09; and Italian lire were a shade higher at 92.65.

Silver hardened on large orders for India, and the price closed at 26 5/16d. per oz.; while Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

BRITISH INDUSTRIES FAIR-BIRMINGHAM-1929
— GAS SECTION —


ABBOTT, J C & Co LTD. — 12 D 1
ABBOTT BIRKS LTD. — 12 A 4
BLAND LIGHT SYNDICATE, LTD. — 12 G 1
BRAY, Geo & Co LTD. — 11 K 2
BRITISH FOREIGN & COLONIAL AUTOMATIC LIGHT CONTROLLING Co
BRITISH ROAD TAR ASSOCIATION — 12 B 1
BRITISH COMMERCIAL GAS ASSOCIATION — 12 L 3
BROMFORD TUBE Co, LTD. — 12K 1 & 2
BRYAN DONKIN Co, LTD. — 11 L 5
CANNON IRON FOUNDRIES LTD. — 11F 2
CUTLER SAMUEL & SON — 12 L 2
CELLACTITE & BRITISH URALITE LTD. — 12 C 2
CLARKHILLS, LTD. — 12A 3
DEAN, W H & SON LTD. — 11 D 3
E B REFRACTORY CEMENT Co LTD. — 11 D 2
EVESONS (COAL) LTD. — 12 B 3
EWART & SON LTD. — 12 M 1
FOSTER INSTRUMENT Co — 11 L 1
FLAVEL S & Co LTD. — 12 E 1
FOSTER & PULLEN, LTD — 11 D 4
GAS JOURNAL — 12 L 1
GIBBONS BROS LTD. — 11 J 1
GIBBONS (DUDLEY) LTD. — 11 J 1
GENERAL GAS APPLIANCES LTD. — 12 F 2
GLOVER, GEORGE & Co LTD — 12 C 4
GLOVER THOMAS & Co LTD. — 11 E 1
HOLMES, W C & Co LTD — 12 D 2
HORSTMANN GEAR Co LTD — 12 B 3
HURRY WATER HEATER Co — 11 K 3
HYDE SILAS — 12 M 2
INCANDESCENT HEAT Co LTD. — 12 J 2
INDUSTRIAL RESEARCH LABORATORIES — 12 M 3
JOYMANCO (BRIGHTON) LTD. — 11 L 4
LIGHTING TRADES LTD — 12 G 2
MAIN R & A LTD. — 11E 1
MELTHAM SILICA FIREBRICK Co LTD. — 11 K 2
METROPOLITAN FUEL Co LTD. — 11 J 3
MACPHERSON DONALD & Co LTD. — 12E 2
NATIONAL GAS ENGINE Co LTD. — 12 J 1
OMNIA MANUFACTURING Co LTD. — 12A 5
PARKINSON STOVE Co LTD. — 12 F 1
PARKINSON METERS LTD. — 12 F 1
PEEBLES & Co LTD. — 12 D 4
RADIATION LTD. — 11 F 1 & 11G 1
RAINSFORD & LYNES LTD. — 12A 1
STOURBRIDGE REFRACTORIES Co LTD. — 12 D 5
SUGG WILLIAM & Co LTD. — 11 H 2
SUTHERLAND METER Co LTD. — 12 E 3
SUTHERLAND A G & Co LTD. — 12 N 4
STEWARTS & LLOYDS LTD. — 11 D 1
SUBMERGED COMBUSTION LTD. — 12 C 5
TAUNTON J & J LTD. — 12 F 4
TAYLOR J (SATURATORS) LTD. — 12A 2
TILLEY BROS LTD — 12 D 4
TIMMIS & Co LTD. — 11 J 2
TORBAY PAINT COMPANY LTD. — 12B 3
WILLEY & Co LTD. — 12 E 5
WESTS GAS IMPROVEMENT — 12 B 4
WILSON GEO (GAS METERS) LTD. — 12 C 1
WALLER GEO & SON LTD. — 11 L 2
WELSBACH LIGHT Co LTD. — 12 G 2
WALKER C & W LTD. — 11 L 3
WHESSOE FOUNDRY & ENGINEERING Co LTD. — 11K 1
WATERLESS GASHOLDER Co LTD. — 12C 3
WOODALL – DUCKHAM COMPANIES — 11H 1
EXIT
EXIT
DINING ROOM
SMOKE ROOM
12 A
12 B
12 C
12 D
11 D
11 E
12 E
11 F
12 F
FROM MAIN ENTRANCE
TO ROYAL DINING ROOM
INFORMATION BUREAU
11 G
12 G
11 H
12 H
11 J
12 J
11 K
12 K
11 L
12 L
SNACK BAR
EXIT
EXIT
EXIT
KITCHEN
SOUTH ROADWAY
FIRE STATION
CONFERENCE HALL
H
TRANSPORT OFFICE
PRIVATE SIDING

PLAN OF THE STANDS, WITH NAMES AND POSITIONS OF EXHIBITORS.

There will appear in the "JOURNAL" dated Feb. 20 an account of the exhibits arranged in the fully representative Gas Section. Everything has been designed to give the industry the status in the Fair which is its due; and a debt of gratitude is owed to the Committee (with Mr. R. J. Rogers as Hon. Secretary) and all who have laboured so hard for the success which is at hand. The co-ordinated display which will make its appeal to the public during the Fair represents, of course, a great deal of spade-work prior to the opening date; and it must not be forgotten that the industry—quite apart from the Gas Section—plays a very large part in the successful organization of the Fair.

The large increase in the number of general exhibitors, and the extensions to the dining halls, have this year necessitated the laying of a new 10-in. main along the whole length of the Fair buildings. Into this, gas will be boosted by means of a Keith-Blackman rotary compressor, to supply an estimated demand of 30,000 c.ft. of gas per hour. From this main branches will be taken off at intervals, and the gas governed down to supply the various sections of the Fair.

Over three-quarters of the total area of the Fair buildings are lighted by overhead high-pressure gas lamps giving a total illumination of 265,000 candle power; gas for these being raised in pressure by means of two 4000 c.ft. per hour Keith-Blackman rotary compressors.

Great extensions have been made to the catering facilities of the Fair, and gas is exclusively used in the eight great

kitchens situated in various parts of the buildings. Over 200 cookers, roasters, boiling plates, vegetable boilers, and other types of canteen appliances have already been installed.

In addition to the requirements of the Fair authorities, the individual exhibitors are large gas consumers. Several of them will consume as much as 2000 c.ft. of gas per hour; and 100 meters of different sizes have been fixed to register supplies to individual stands. The gas consumption for the Fair when on normal full load will exceed 30,000 c.ft. per hour; and in fitting-up the various sections, over 5 miles of piping have been used. In the administrative and other offices 50 gas fires have been fixed; and a further 50 fires will be in use in the various dining rooms and snack bars, together with a number of specially designed patent heaters.

JOINT GAS CONFERENCE.

There is a general looking forward to the three days' Joint Gas Conference, under the auspices of the Institution of Gas Engineers, the Society of British Gas Industries, the British Commercial Gas Association, and the National Gas Council. We publish below the full programme of the conference, which has been received from the Hon. Secretary (Mr. H. C. Smith, M.Inst.C.E., of Tottenham).

PROGRAMME.

Tuesday, Feb. 19.

10.30 a.m. Chairman, Viscount Ednam, M.C., D.L. Conference Hall, British Industries Fair.

Official welcome to members by the Lord Mayor of Birmingham and the President of the Birmingham Chamber of Commerce.

Reply by Mr. Frank H. Jones, M.Inst.C.E., President of the Conference, and Viscount Ednam.

11.0 a.m. Paper by Mr. R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S., on "Gasholders," to be followed by a discussion.

1.0 p.m. Informal luncheon in the "AA" North Dining Room. Tickets for this luncheon, at 5s. per head, exclusive of wines and cigars, may be obtained from the Hon. Secretary.

Afternoon. Inspection of exhibits at the Fair.

4.0 p.m. Meeting of the General Committee of the British Commercial Gas Association, in the Conference Hall.

Wednesday, Feb. 20.

10.15 a.m. Chairman, Mr. Frank H. Jones, M.Inst.C.E. Conference Hall, British Industries Fair.

10.30 a.m. Paper by Mr. Stephen Lacey, B.Sc., Assoc.M.Inst.C.E., "Gas Appliances—Testing and Maintenance." Discussion.

1.0 p.m. Luncheon in Royal Dining Room by invitation of the Fair Management Committee. Tickets of admission may be obtained from the Hon. Secretary. As the accommodation is limited, early application should be made.

Afternoon. Inspection of exhibits at the Fair.

Thursday, Feb. 21.

10.0 a.m. Chairman, Mr. John Terrace, M.Inst.C.E.
Assemble at the Birmingham and Midland Institute, Paradise Street (Small Lecture Theatre).

10.15 a.m. Lantern slides and description, by Dr. C. M. Walter, of the gas-heated industrial appliances in nse in the works to be subsequently visited.

10.45 a.m. Adjourn to 'buses, which will be provided for visits to the following works:

(These visits are alternative.)

(*a*) Birmingham Gas Department Industrial Research Laboratories, Demonstration Rooms, and Heat Treatment Shops, including the Physical Testing Laboratory at the Council House, the Showrooms and Demonstration Rooms at Atlas Buildings, and the Heat Treatment Rooms at the Windsor Street Gas-Works.

(*b*) Messrs. F. H. Adams, Ltd., Handsworth. This firm are manufacturers of aluminium die castings. They have a very up-to-date installation of gas furnaces, and the works are well worth visiting.

(*c*) Messrs. Alfred Hughes & Sons, Adderley Park. This firm are biscuit and cake manufacturers; and four large gas-heated biscuit furnaces are installed in the factory.

(*d*) Messrs. Moss Gear Company, Tyburn. This firm are manufacturers of gears, gear boxes, and other motor components. It is a new works planned on modern lines with decorative painting and a huge floor area, and includes a very well arranged heat-treatment shop and compressor boosting station.

1.0 p.m. Luncheon in the Conference Hall, British Industries Fair. Tickets for this luncheon, at 5s. per head, exclusive of wines and cigars, may be obtained from the Hon. Secretary. As accommodation is limited, early application should be made.

Afternoon. Inspection of exhibits.

NOTES.

Transport to and from the Fair.—'Buses will leave the Chamber of Commerce, New Street, Birmingham, every few minutes for the Fair, and in addition a special service of trains will run from New Street Station to Castle Bromwich Station, which adjoins the Fair.

Engineers' Club.—Members attending the Conference are invited to accept the hospitality of the Engineers' Club, Waterloo Street, Birmingham. They will become Hon. Members for the period of their stay, and will receive a card on application at the Club.

INDUSTRIAL GAS SALESMEN'S CIRCLE.

The Committee responsible for the organization of the Joint Gas Conference to be held at Birmingham in connection with the British Industries Fair have extended an invitation to industrial salesmen to attend the Industrial Gas Session of the Conference on Thursday, Feb. 21.

The City of Birmingham has so fine a record with regard to the variety and magnitude of the use of gas for industrial purposes that every gas salesman will undoubtedly wish to avail himself of the opportunity of examining the modern installations of gas furnaces which will be available for inspection.

ANNUAL MEETING OF GAS SALESMEN, FEB. 27.

In connection with the Annual Meeting of Members of the British Commercial Gas Salesmen's Circles on Wednesday, Feb. 27 (the programme for which is given below), a special train will be leaving Euston at 8.45 a.m., and is due to arrive at New Street, Birmingham, at 11 a.m. in time for the business meeting, which commences at 11.15 a.m. in the Town Hall.

The special train will make the return journey to London, leaving New Street at 6.25, and arriving at Euston at 8.31 p.m. The special return fare is 12s.; and any members of the gas industry wishing to travel by this train can obtain tickets on application to the Secretary of the British Commercial Gas Association. Tickets cannot be purchased at Euston. Hot supper will be served on the return journey at 3s. per head.

PROGRAMME.

Wednesday, Feb. 27.

11.0 a.m. Assembly of members.

11.15 a.m. Opening address by the Executive Chairman, Mr. F. W. Goodenough, C.B.E.

Statements by the District Chairmen with regard to the work of the Circles.

Address by Sir Gilbert C. Vyle (Past-President of the Associated Chambers of Commerce, and President of the Midlands Branch of the Incorporated Sales Managers' Association).

1.0 p.m. Adjournment.

1.15 p.m. Conveyance by 'buses from the Town Hall to the British Industries Fair.

Informal lunch at the Fair.

2.30 p.m. Official inspection of the Gas Industries Section of the British Industries Fair.

Thursday, Feb. 28.

The British Industries Management Committee are providing luncheon for gas salesmen who may be extending their visit to the Fair over Thursday.

Admission to this luncheon will be by ticket only, which must be given up at the entrance to the Luncheon Room.

Applications for tickets should be made to the Secretary, The British Commercial Gas Association, 28, Grosvenor Gardens, S.W. 1.

ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.

The Hon. Secretary of the Association, Mr. W. J. Liberty, has forwarded the following programme of the meeting of the Association which is to take place at the British Industries Fair, Birmingham, on Feb. 21 next.

Morning. Inspection of Fair.

1.0 p.m. Luncheon in the Conference Hall, by arrangement with the Gas Industries Section.

2.30 p.m. Meeting in the Conference Hall, to see some lantern slides from photographs taken by the President (Mr. J. F. Colquhoun, City Lighting Engineer, Sheffield) during his recent visit to the United States, in connection with the International Commission on Illumination. The slides illustrate American street lighting practice; and it is hoped that time will permit of a short discussion.

At this meeting it is hoped to outline the arrangements for the Sixth Annual Meeting and Conference and Exhibition of Public Lighting Appliances to be held at Bournemouth in September.

4.0 p.m. Meeting of the Council.

Gas from Drip Oil.—An American gas company making carburetted water gas was ordered to cease dumping into sewers the drip oil and water which collected in its distribution system. The drip was brought back to the plant. Burning proved out of the question, because of the smoke nuisance which resulted, and the problem was referred to the Semet-Solvay Engineering Corporation for solution. The firm equipped the company's "back-run" water gas machines with superheater sprays. The drip was pumped, just as it came to the plant, through the sprays and into the top of the superheater during the back-run part of the gas-making cycle. The water content of the drip was changed into steam, and the oil was cracked in passing through the machine. Every constituent of the drip was utilized in making back-run gas.

MONTHLY GAS ACCOUNTS.

Successful Mechanical System Operated by the South Metropolitan Gas Company.

The system of presenting consumers with their gas accounts monthly was introduced by the South Metropolitan Gas Company in April last. Special machines for dealing with the work have been installed; and the purpose of this article is to give our readers some idea of the remarkably efficient manner in which the Company render their monthly accounts to approximately 115,000 consumers through ordinary meter. Experience of the system during the past nine months has proved it to be generally popular among consumers in the Company's area—far more acceptable than the quarterly demand method previously in vogue.

Our views on the question of monthly accounts were expressed in the "JOURNAL" for Nov. 14 last, when we said: "Were quarterly payment of wages and salaries the general rule, rather than the rare exception, there would be nothing to be said against the quarterly bill; but so long as the present system prevails, Lady Day, Midsummer Day, Michaelmas, and Christmas are bound to remain times of tribulation for the vast majority of people. That is to say, unless it be possible to do away with some of the quarterly accounts, or at any rate vary their incidence. . . . The rendering of monthly accounts is now more prevalent than was the case before the war; but still the big ones come in a crowd at the end of the quarter or the half-year. The gas bill is, in the case of the ordinary consumer, one of those which are apt to make their appearance at an inconvenient moment; in other circumstances its popularity might be greater. . . . We are well aware that monthly gas accounts, and also continuous meter readings, have previously been suggested, and may be now in operation; but is there not room for a wider adoption of methods which might do something to lessen the quarter-day burden?"

PRACTICAL SOLUTION AT OLD KENT ROAD.

The Company's area of supply is divided into 32 districts for meter reading and accountancy purposes, and accounts are rendered on 16 days of each month. Meter reading commences 8 days prior to the end of the month, and continues for 8 days into the next month. Meters are always read in the same street-walking order, so that, with the exception of cases where the meter reader is unable to gain admittance, a month always elapses between readings. Accounts are billed at the Company's Chief Offices at Old Kent Road on the second day after the regular meter reading day; one day being allowed for checking purposes.

In the Billing Department there is a ledger card in respect of each account. These cards are filed in street order, and each one bears a reference number, which appears on the bill. The bills are prepared on addressing machines prior to receipt of meter books, and stored away in readiness. Any change of consumers taking place in the interim is immediately recorded, and fresh stencils are cut, from which new ledger cards and bills are printed.

The accounts are prepared on Burrough's "Public Utility" machines. These are equipped with an 18-in. platen divided into two sections. A summary sheet with carbon in front is inserted round the right section of the platen; a special chute for the bill being arranged in the front of the summary sheet on the carriage. The left section of the carriage is fitted with an adjustable chute, which receives the ledger card. Bills and ledger cards may be inserted and removed without affecting the summary sheet, which remains round the platen, and automatically spaces the necessary distance for each item.

WORKING OF THE MACHINES.

When the meter books reach the Billing Department, they are distributed among the operators, who then select the ledger cards and bills relating thereto, which are filed in the same order as the meter book records. The relative ledger card and bill are placed in their respective chutes; the summary sheet and carbon having been already inserted. The meter book is opened on a table beside the machine, together with a calculation chart, showing the equivalent of cubic feet, therms, and cash. The operator then, by depressing the appropriate keys on the keyboard of the machine, transmits to the bill the information contained in the meter book. The previous and present meter readings constitute the first operation. The difference between the two is calculated by the machine, and all three figures are printed on a portion of the summary sheet which is not covered by the carbon paper. By referring to the calculation chart on the table, the operator finds the equivalent number of therms, and the charge, relating to the number of cubic feet—*i.e.*, the difference between the previous and the present meter readings. These are duly tapped out on the machine, and printed, first on the bill, and then, by means of the carbon sheet, on the summary sheet. A similar process applies to charges in respect of meter rent, stove hire, hire purchase, &c., which also appear in the meter book. Any amount showing on the ledger card as being unpaid is typed, and a total printed of all the items. The carriage of the

THE BILLING DEPARTMENT AT OLD KENT ROAD.

Showing the Appearance of the Machine.

Operator at Work.

machine has meanwhile been automatically moving along, so that the respective figures appear in the correct columns of the bill and summary sheet; and when the "total" key is depressed, the amount is printed on both the bill and the ledger card, and the carriage of the machine returns to a starting position for the next account.

The summary sheet will take the information contained on approximately 40 bills, and, in addition to being a carbon copy of the bills, also shows the meter readings. By means of a cross-reference on the ledger card, the details of any account may be quickly and easily obtained. On completion of the summary sheet, "total" keys are depressed, and the machine, which has been adding vertically in separate registers, types the various totals. The totals for cubic feet, therms, and sterling are then compared, and provide an effective check, as they would not agree had a wrong calculation been made. The other monthly charges are also examined; and the bills are then ready for the consumers.

The information on the summary sheet, having been arranged in parish and district order, forms the basis of the Company's total charges, for balance-sheet and rate assessment purposes. The bills are taken to the Despatch Section, where they are placed in folding machines, put into "window" envelopes, and sorted into postal districts, ready for collection by the General Post Office.

CREDITS.

It is indicated on the back of the bills that payment may be made at the Company's Head Office, at the district showrooms —of which there are 10—and also at all branches of the Midland and of Barclays Banks—of which there are 92—on the Company's area of supply. Advice of payment from these various sources reaches the Billing Department each morning. The respective ledger cards are "pulled" from the cabinets, and the credits posted by credit-posting machines which register each amount and give a total on completion, thus providing a system of sectional balancing.

DISTILLATION OF BROWN COAL IN AUSTRALIA.

Excerpts from an Address by Dr. J. Henke, of Halle, who is associated with "L. & N." Brown Coal, Ltd., as Mining Lay-Out Adviser.

A specially important branch of the development of the Victorian brown coal in future will be the production of benzines, motor spirits, lubricating oils, &c. For almost half a century an old system, the Rolle furnace, has been used in Germany. It deals with only 4½ to 5 tons of coal per day, and extracts only about 50 p.ct. of the tar contained in the coal. New methods have, however, been investigated. They can deal with 100 tons of coal per day or more, whereby 90 p.ct. of the tar contained in the coal is recovered. One of these new methods is the "L. & N." process of Sensible Heat Distillation, Ltd. Though I am the Technical Adviser of "L. & N." Brown Coal, Ltd., my opinion of the method of coal distillation is unbiassed. I can safely say that the "L. & N." distillation process constitutes a very simple, and one of the best, methods of coal distillation, for the following reasons:

The process is simple and economical. The temperature of the heating gases with which the distillation of the coal is effected can be regulated and maintained accurately at a constant level. A special advantage is that the heating gases are forced into the kiln. Every coal—the brown coal of Victoria, the black coal of New South Wales, and the oil shale of New South Wales and Tasmania—contains a certain amount of sulphur, which is transformed during the process of distillation into sulphur dioxide. In other distillation methods, the heating and distillation gases are drawn through the kiln. These gases come into contact with the inner parts of the suction plant through which they have to pass, and the sulphur dioxide has a destroying effect thereon. This is eliminated with the "L. & N." machinery. With other methods of distillation, coke is withdrawn from the kilns at a temperature of from 450° to 500° C., at which temperature it ignites easily. The "L. & N." kiln has a special sluice for the removal of the residual fuel before it comes into contact with the atmosphere, by means of which it falls into a cylindrical outer chamber in which pre-cooling is effected to a temperature of 160° to 200° C.

In Germany brown coal is distilled if it contains more than 6 p.ct. of tar. In Australia there is coal which contains 10 p.ct., and even 13 p.ct. of tar. By distillation of English black coal, as done by the "L. & N." retorts at Barnsley and Leicester, 9 p.ct. of tar has been obtained from the coal, and 65 to 70 p.ct. of residual fuel.

The oil from lignite distillation is recovered in the distillation plant and can be refined by two processes. In the first place, the tar is washed with alcohol before treatment. The clean oil is then treated by physical and chemical processes, and made into motor spirit, benzine, yellow oil, motor oil, gas oil, paraffin, and other products.

Safety in Mines Research Board.—As the result of investigations previously carried out by the Safety in Mines Research Board, means have been devised to allow for complete or partial release of the pressure developed by firedamp explosion within closed vessels, such as the casings of electric switchgear, and at the same time to ensure that the flame of the explosion shall not pass from the casing to the atmosphere outside. Experiments carried out by Beyling have, however, suggested that, when the casings are divided into intercommunicating compartments by partitions, the ignition of an explosive mixture in one compartment might result in considerably enhanced pressure being produced in the other. An account of an investigation into this possibility is contained in a paper entitled "Firedamp Explosions within Closed Vessels: 'Pressure Piling,'" by C. S. W. Grice and R. V. Wheeler (Safety in Mines Research Board Paper No. 49, price 1s. net). The research has shown that, if an explosion of firedamp and air is allowed to propagate from a casing of comparatively large volume through a narrow opening into a casing of comparatively small volume, pressures considerably above the normal are very rapidly produced within the smaller casing, and that under these conditions even weak mixtures of firedamp and air can produce violent explosions. Care should therefore be exercised in the design of casings to avoid interconnected compartments.

AUSTRALIAN GAS INSTITUTE.

Presidential Address of Mr. R. G. Parsons, Manager of the Footscray Works of the Colonial Gas Association, at the Annual Meeting held in Melbourne on Nov. 20, 1928.

[EXTRACTED.]

Prior to my addressing you on matters appertaining to our industry, I think it is fitting that we should pause for a moment out of respect to members who, since our last meeting, have passed on. I refer to our Hon. Member, the late Hon. Geo. Swinburne, and the late Mr. W. Friend. Both of these gentlemen were associated with the Victorian Gas Managers' Association since its inception, and their names are written high on the roll of our industry.

The gas industry I venture to suggest has a great future ahead of it rather than a past behind it. Of the 105 gas undertakings in the Commonwealth producing 19,836 million c.ft. annually, and consuming approximately 1,350,000 tons of coal, practically all show increased sales.

In 1914 the total gas produced by these undertakings was 9200 million c.ft. Compare this with to-day's output, which shows an increase of 115·6 p.ct., and it will be appreciated that gas is still a modern product of "Old King Coal." Figures from other countries indicate that the same expansion of the industry is taking place.

While we appreciate that both gas and electricity have their uses, it is to be hoped that Governments, which are spending large sums of money in the development of State operated electrical undertakings, will realize the importance of our industry, and not hamper it with any unwise restrictive legislation in the future, but leave it free to develop, so as to permit of its rendering the maximum service to the community.

PROGRESS IN CARBONIZATION.

It is now 91 years since gas was first manufactured in Australia, and, while the carbonization process remains substantially the same as at the beginning, it has, during the last twenty years, undergone a considerable change. Every industry is said to have its periods of transition, and, though ours has not had very many, the advent of the vertical retort took us a long step forward in placing the industry, so far as the manufacture of gas is concerned, on a more efficient and sounder financial basis.

One of the ideals which I feel should be striven for in coal carbonization is the reduction of outlay in heat energy required in the process, and one which in the construction of new plants might, I suggest, well be given greater attention by engineers. I refer particularly to the relative conductivity of the refractory materials used in the construction of retorts and interiors of settings.

Most modern carbonizing plants use between 14 and 16 p.ct. of the total throughput of coal, and though the adoption of the waste-heat boiler has assisted in reducing the amount of heat losses, the more rapid transference of heat through the retorts would result in considerable savings. Not only would this mean fuel economy by permitting an increased throughput, but there would be a lower capital outlay necessary in carbonizing plant, which forms such a large percentage of capital invested in works installations.

Until a year or two ago 2 and 3 tons per day retorts were considered a long step forward, but to-day even 10 or more tons per day are planned for the future. This indicates the advance that is taking place, and the gas industry generally owes much to the pioneers of the vertical retort, and manufacturers on the other side who have developed them.

COMPLETE GASIFICATION.

This method of gas production does not seem to have progressed, so far as its application to gas-works practice is concerned, during the last few years This, perhaps, is due to the lack of adequate technical development given it. On the other hand, it may be that the low calorific value of the gas produced prevents most of the gas companies, who are bound by legislation to supply a higher quality gas, from adopting this method. Still the time may come when the principal bye-products—coke and tar—will be more difficult to dispose of, and we shall then have to give more attention to this process of manufacture.

LOW-TEMPERATURE PROCESSES.

During the last few years much has been heard about low-temperature carbonization, and while there is no doubt a very extensive field for the establishment of such a plant in Australia for the production of oils, motor fuels, &c., I feel that the success of the process depends primarily on the price of coal.

While dealing with the matter of carbonization, it may be of interest to refer to the results obtained in the Glover-West plant at the Footscray Works of the Colonial Gas Association, Ltd., in which, as you are aware, I am deeply interested. The installation was started up in June, 1926. It comprises 3 beds of 8 retorts, each 32 in. by 10 in. by 25 ft. long, with a special arrangement for steaming. The capacity of this plant was designed for 1½ million c. ft. per day. During the first year the plant was operating, the output of gas averaged 800,000 c.ft. per day, and to-day 16 retorts are working, the output averaging over 1 million c.ft. per day.

Provision for extensions has been made by having a fourth setting skeleton built, and a contract for the completion of the fourth bed is now in hand.

The figures for the two years are as follow:

—	Coal Carbonized.	Gas Made.	Gas Sold.
	Tons.	C.Ft.	C.Ft.
Year ended June, 1927 . . .	15,223	305,564,000	288,639,000
" " " 1928 . . .	16,001	336,032,000	312,837,000

The average yield for the two years was over 20,000 c.ft. per ton, and the actual gas sold over the counter was 19,000 c.ft. per ton, or 95·13 therms; the unaccounted for averaging 6·32 p.ct. for this period.

Residuals.—These for the same period are as follow:

Coke	8·34 cwts. per ton
Tar	30·4 gallons per ton
Ammonia (calculated as sulphate) .	33·8 lbs. per ton

The coal used was the best Maitland large from Pelaw Main, Abermain and Aberdare Extended Collieries.

REPAIRS AND MAINTENANCE.

Though this is an important item in manufacturing costs, it was estimated that repairs and maintenance would be somewhat higher with vertical than with horizontal retorts. This, however, has not been so, the average for the last twelve months being 3·8d. per 1000 c.ft.

SCIENTIFIC CONTROL.

I appreciate, of course, that most large works have many scientific instruments for the recording of calorific values, pressures, &c., yet I feel that there is ample room in a modern gas-works for additional scientific apparatus. Though costly to instal, they would, under the control of the laboratory, bring about considerable economies and better operating conditions on the manufacturing side.

The time has arrived when the industry will have to give greater thought to training young men to graduate for responsible positions in its manufacturing departments. The employment of men with a general chemical engineering knowledge appears to be more essential to-day, particularly in view of the development of the chemical side of the industry.

RESIDUALS

These are by no means as easy to dispose of as in years gone by. At one time coke was difficult to obtain at many gas-works without requisitioning it; but to-day most companies find difficulty in placing their output. In Victoria, the brown coal briquette has in many instances replaced coke, particularly in the domestic field, and in those areas where the smoke nuisance compelled industries to seek a smokeless fuel. Coke and coke breeze were generally used, but now most of this business has been captured by the briquette.

An idea of the increased sales of these briquettes is obtained from the following: The State Electricity Commission sold 121,957 tons of briquettes and 33,097 tons of brown coal during the year ended June, 1928. They now have in hand extensions to their plant which will produce an additional 200,000 tons per annum. This position as far as Victoria is concerned must materially affect the coke market.

TAR.

The demand for tar for road making has undergone a considerable change during the last few years. In fact some undertakings are experiencing difficulty in disposing of their output; one of the reasons for this being the increased quantities of tar resulting from the adoption of the vertical retort. The tars produced by the vertical system of carbonization differ considerably from those obtained from horizontals, and where 10 to 12 gallons of tar resulted from each ton of coal carbonized, we have now to find an outlet for 20 to 30 gallons per ton.

Speaking generally, while crude horizontal tars, when straight distilled, are quite satisfactory for road surfacing and construction, vertical tars cannot be used without special treatment. This in many cases has been neglected, with the result

that many municipal engineers have been forced, owing to the unsatisfactory results obtained, to change over to bitumen for surfacing and general pre-mixed macadam work.

Another factor operating against the use of tar for this work is the fact that a tar dressed road requires, more or less, treatment each year, while bitumen gives a satisfactory surface for at least two or three years. When the cost per gallon of these two products to-day is compared, one can appreciate the preference that many engineers have for the imported article.

To appreciate the increasing demand for bitumen as a road binder, one has only to compare the imports of this product during the last three years, which are as follow:

	Tons.	Value. £
1926	38,200	232,000
1927	75,000	404,000
1928	90,000	490,000

The figures are more significant when totalled and converted into gallons, which amount to 45,400,000 gallons. This is nearly double the amount of tar produced by the gas industry in Australia, and therefore it will be quite evident that bitumen cannot by any means be entirely replaced by tar.

Though Governments frequently refer to the importance of using local manufactures, apparently no steps are taken by them to direct the various Road Boards to use prepared tars. There are many medium traffic highways now under construction in most of the States of the Commonwealth, for which the Federal Government is subscribing millions of pounds, and these could absorb considerable quantities of tar. Excellent work can be done with suitable grades of specially prepared tars for base work, and if the road engineers were to adopt this method, using (say) bitumen for the top coat or wearing surface, an entirely satisfactory road could be constructed, and a solution to the tar proposition achieved.

This is a matter which vitally affects all gas companies, and one which calls for further research and co-operation. Unless Governments and municipal authorities give more consideration to the continued use of tar, companies will, sooner or later, be forced to consider other means for the disposal of this bye-product, and may have to resort to distilling the tar, coking the pitch, and disposing of the tar oils as fuel. Any consequent loss as a result of this must inevitably be borne by the gas consuming public. Such a position we must use every endeavour to avoid.

It may be of interest to mention that the annual production of coal tar in Great Britain is approximately 2 million tons, and, as an indication of the extent to which the preparation of road tar is increasing, it is estimated that in 1923, 450,000 tons were sold, and in 1927 700,000 tons, an increase of 55 p.ct. for the five years; while the importation of bitumen over the same period was 262,871 and 260,640 tons respectively. The value of the output of firms engaged in the tar paving and road material business in 1924 was £2,208,000 for tar and tar macadam, as compared with £670,000 for asphalt and bitumen.

It is stated that the general trend of policy on the part of highway authorities in Great Britain is towards the adaption of their roads to the requirements of modern traffic by the use of tar; it being contended that tar macadam and tar surfaced roads are quite satisfactory, and far safer for motor traffic than bitumen. This is certainly encouraging. Quite recently the Slippery Roads Committee was instrumental in having many miles of bitumen roads surfaced with tar. I suggest that the time will soon arrive, if it has not already done so, when the industry must consider greater co-operation on this important subject.

AMMONIA.

Two years ago the outlook for this bye-product (sulphate of ammonia) was by no means promising. To-day the local demand very nearly exceeds local production. This healthy condition is largely due to the activities of the Australian Sulphate of Ammonia Propaganda Committee, and the general adoption of the manufacture of neutral sulphate.

The price to be obtained for this bye-product in the future largely depends on how long it will be before the manufacture of synthetic ammonia takes place in Australia. In most countries where synthetic production has taken place, the selling price of sulphate has fallen considerably. It has already been intimated through the Press that the Imperial Chemical Industries, who are now producing 250,000 tons of sulphate per annum in Great Britain by the fixation of atmospheric nitrogen, are considering the establishment of a synthetic ammonia plant in Australia. It is also of interest to note that this large undertaking is also interesting itself in the treatment of coals in this country.

There is little doubt that if this Company enters into the ammonia field that prices obtained for sulphate will fall.

DISTRIBUTION.

The distribution of gas by high pressure has one advantage in that the fluctuations in demand can be more easily met, particularly in areas where a large industrial gas consumption has to be provided for, while complaints are considerably less, and in some cases almost unknown. As evidence of this, eighteen months ago my Directors decided to extend our mains to a district four miles from the end of our existing reticulation. As the low-pressure system could not possibly permit of this added load, it was decided to lay an 8 in. high-pressure main as an extension of our existing high-pressure system.

In many of the streets reticulated in this district the houses were so far apart that to have installed a low-pressure system would have involved such a high capital cost that the price to be charged for gas would have been such as to have prejudiced the proposition. The alternative was to extend the high-pressure feeder main through the centre of the section most built on. Thus it was possible, by using smaller mains and connecting up the circuits, to reduce the capital involved per mile of main, and so cover a larger area.

Each service has a control governor attached, and of the 700 consumers connected, out of the 1053 houses passed, we have not had a single complaint. In fact, other than the staff required for the new extensions and collections, no complaint service staff has visited the district. I mention this because I really believe that future extensions of our reticulation systems by means of high pressure will mean lower capital charges on the distributing system, or, alternatively, will permit of a greater mileage for the same cost. This latter is important, when it is considered in the future, more than in the past, that we must pay more regard to the development of new subdivisions as soon as houses begin to be erected, and not wait until the whole of a street is well built on and made an attractive proposition.

STORAGE OF HIGH PRESSURE GAS.

The introduction of the "Hortonsphere" is quite a new development, and offers ideal storage in districts in which high-pressure distributing systems are operating, and where pressures over 5 lbs. are used, and should prove of considerable help in meeting peak load periods at the end of a long line of main. At the same time, the period of boosting during the off-peaks can be materially reduced. At Dandenong, the Colonial Gas Association is employing this method, but is using tanks instead of the sphere, the pressure being 50 lbs. per sq. in.

WATERLESS GAS HOLDERS.

I understand that the Brighton Gas Company in Victoria is erecting a waterless holder in one of its districts. This will be the first gasholder of its type in Australia.

INDUSTRIAL GAS.

While many of the larger undertakings have their own industrial gas departments with trained staff and appliance laboratories, I suggest that many of the smaller ones should consider developing as much as possible this most important section. There is little doubt that, with a trained salesman having an engineering knowledge, and where special rate concessions are obtainable, we can, with efficient equipment properly operated, sell and distribute heat with such efficiency that there need be little fear of other heat competitors.

Often failure to hold an industrial consumer is due to attempting to improvise some existing piece of plant, whereas, if a properly designed furnace had been installed in which the correct type of burner, giving as near complete combustion as possible, were used, success would result in the majority of cases.

Many ask how a small company is to secure the expert, for an expert he must be. While I appreciate the difficulty, I feel that there should be some central body employing such an expert who could be loaned for a period each year. May I suggest that possibly the Gas Companies' Association and the New South Wales Commercial Gas Association could, in the absence of a general industry authority, consider the problem of solving the small companies' position.

As an indication of how an industrial load helps to increase the sales, it might be of interest to mention the percentage of gas sold in the three districts attached to the Footscray Works of the Colonial Gas Association, Ltd.

Footscray	10 p.ct. gas used for industrial purposes
Williamstown	18 " " " " "
Sunshine	15 " " " " "

While it will be realized that the three districts mentioned are certainly industrial centres, there must be many undertakings which have several manufacturing establishments in their areas of supply.

No company, particularly in the southern States where the price of gas is higher than those nearer the source of coal supply, can expect to obtain its share of the industrial load unless it can see its way clear to attract this business by offering to supply on the basis of a sliding scale.

THE DOMESTIC LOAD.

Our domestic load constitutes the major part of our sales. Have we investigated them to see if the consumption per meter has increased or decreased? I fear that an examination in many cases would indicate the latter. How can this be re-

placed? Are the other appliances, such as fires, water-heaters, wash coppers, being brought actively before the public? All of these are important load builders.

A question often asked is, "How can we sell more of these appliances?" In my opinion we rely too much on the display in our showrooms. How often does one see any gas appliance other than (say) a gas cooker featuring in some general emporium, showroom, or window? I cannot recall ever seeing a gas fire exhibited for sale in any other place than a gas company's showroom. What is the reason? Are we attempting to dominate the sale of gas appliances by selling at prices below which the store can make a reasonable profit, or is the competition in the manufacture of gas appliances, particularly domestic appliances, so keen that the prices to gas companies are less than those of the storekeeper? There surely must be something more than the terms offered by gas companies that prevents so many warehouses from pushing the sales of gas appliances.

ADVERTISING.

While I do not wish in any way to deprecate the value of the excellent work done by the Gas Companies' Association of Australia, the New South Wales Commercial Gas Association, and the individual undertakings themselves, I do desire to emphasize that in the province of advertising, where the highest degree of skill is essential, as well as in many other departments of the industry, there is still, I feel, a great need for co-operation. More particularly is this so when it is remembered that every gas undertaking has to face, in varying degrees, the operations of an enterprising competitor. An unsuspecting confidence in our products, aided by the co-operation in every department of our industry, must surely suffice to overcome any prejudice.

SALES ORGANIZATIONS.

Have we arrived at a time when a change in the conduct of our business is on the horizon? I refer more particularly to the organization of sales effort, and I would here like to make reference to what I feel is a very significant statement made by Mr. Samuel Insull, President of one of the large American gas utility companies, who, when addressing a gathering of the gas profession in that country, in referring to the future of the industry, said that the gas engineer had gone just as far as he could, and it would be economically impossible for him to go further until the load per meter had been tripled.

Such a statement, though highly controversial, can hardly be accepted in general terms, but may suggest that the future growth of the industry must come from a new business department. Significant as this statement may be, the growth of our business certainly needs developing by up-to-date methods. Take the existing domestic load per consumer. This does not increase unless some additional heating equipment is sold to him, indeed the desirability of added sales per consumer cannot be too strongly stressed. This leads one to consider whether a new policy is not desirable, and, while it is admitted that there are many intricate questions involved, let us frankly face the facts, and discard some of our old methods for new ones.

Is there any reason why we should not reconstruct our sales organization? Take the question of the restriction of appliance sales to the Gas Companies Organizations. Could not much be achieved by closer co-operation with the manufacturers, general hardware stores, and the gas companies? Our electrical competitor, it will be admitted, takes full advantage of the goodwill value of the retail houses. Do we consider what has been the result of the co-operation for that industry? I suggest that not only has it added consumption per domestic consumer, but also considerable new business. Why, therefore, are we not participating in this field?

While it will be accepted that we must sell more appliances every day in order to extend, can we not take full advantage of every other outlet, in addition to those which our own sales organizations provide? This may not find general agreement, but is, I feel, worthy of consideration.

In addition to the concentration of sales effort, the selling price of our product has a material bearing on the expansion of our business. The question of suitable discounts, or even the application of a two-part tariff, may be necessary to enable the industry to continue the growth of the past few years. I am, however, convinced that in the future gas must be cheaper.

THE TREATMENT OF COAL.

At the Royal Society of Arts on Monday, Jan. 21, Dr. C. H. Lander (Director of Fuel Research, Department of Scientific and Industrial Research) gave the first of a series of three Cantor Lectures on the "Treatment of Coal," and dealt with the use of coal in its raw state. Dr. R. Lessing was in the Chair.

The CHAIRMAN, who said it was unnecessary for him to introduce Dr. Lander, said it was not very long since that the treatment which coal received was merely to bring it up from the bowels of the earth, and to place it on the railway truck or on a steamer, and leave it to the buyer to use it in a more or less inefficient manner. That position, however, had changed considerably during recent years, and was continuing to change very rapidly. It was appreciated to-day that coal could not be used to advantage without some treatment, and great endeavours were being made technologically to that end. The Royal Society of Arts could not have selected a better person to discuss the position of the industry to-day than Dr. Lander, who was in the position of being able to give an unbiassed and well informed account of the position. He was only just back from the United States, where he had made an extensive study of what was being done there, and at the same time he had represented this country at the International Conference on Bituminous Coal.

Dr. LANDER said that, roughly speaking, only about 20 p.ct. of the total production of coal in this country to-day was treated in the carbonization industry, and it was obvious, therefore, that the study of the use of raw coal must continue to receive serious attention. The employment of the numerous types of coal for the purposes for which they were best suited entailed a knowledge of their physical and chemical characteristics, a full understanding of which depended upon the elucidation of the constitution of coal. This was being sought after in several ways, including chemical analysis, microscopical examination, and X-ray work. He explained the difficulties of correlating the figures of chemical analysis obtained by different workers under presumably the same conditions, and indicated how the Fuel Research Board and the British Engineering Standards Association have endeavoured to formulate methods which could be widely adopted for the analysis and sampling of coal. One of the difficulties with regard to sampling was that there were two sides to the question. There was not so much difficulty when firms like the South Metropolitan Gas Company shipped coal from the north of England, and sampled it as it went into the boat by a good method, but the difficulty arose when coal was exported, and the buyer was not satisfied with the analysis at the exporting point, and insisted upon sampling it at the importing point. Thus there were two analyses carried out essentially in different ways, and the results were usually hopelessly inconsistent. As a matter of fact hundreds of thousands of pounds sterling had been squandered in law suits owing to the fact that it was extremely difficult to get concordant results by sampling into and out of a ship. Personally, he believed that sampling into the ship was the one which gave the most reliable results.

MICROSCOPIC EXAMINATION.

The aid of the microscope had also been enlisted in the examination of coal, the aim being to determine the botanical nature of the original material, and the nature of the physical and chemical changes which accompany its transformation into coal, and to correlate this information with the properties of the surviving material. Considerable progress had been made in the use of the microscope for correlation purposes both by Thiessen in the United States and in this country, where a different technique had been developed, and was being used in the physical and chemical survey now being carried out here.

After a reference to Seyler's metallographic method of coal examination, and the application of X-rays, Dr. Lander pointed out how the necessity for such detailed investigations increased with the complexity of the process to which it was intended to subject the coal, and added that the ordinary criterion of thermal efficiency was very imperfect, and was not really the most scientific. The more truly scientific criterion of efficiency was commercial efficiency, because commercial efficiency, or dollar efficiency, as it was sometimes called, was the only measure of ascertaining the real thermal efficiency, though this seemed something of a paradox.

PULVERIZED FUEL.

The combustion of solid fuel must always suffer from the disability that, unlike oil, it could not be immediately vaporized, but it could still be brought by pulverization into a state in which the surface exposed to the action of air was enormously increased over that of the lump, or even of the slack, form, though with the finest pulverization possible the particles still remained large compared with chemical molecules. Some

account was then given of the efforts that have been made to introduce turbulence when burning powdered fuel in order to expose the greatest possible surface to the action of the air introduced with the fuel, and how it had been found that streamline action was not the most efficient process. It was due to the introduction of controlled turbulence that success in the use of powdered fuel on locomotives could be looked for. The relative advantages and disadvantages of the unit and centralized systems of using pulverized fuel were enumerated, and it was pointed out that in America over 25 million tons of coal were consumed in the pulverized form in 1928. Even in America, however, it could be said that the use of pulverized fuel was still in its infancy, a remark which applied even more to Great Britain. In large scale powdered coal installations very high efficiencies of steam raising, (say) 80 p.ct. to 90 p.ct., could be maintained. It was also claimed that, owing to the general application of water or steam cooling of the combustion chambers of pulverized fuel plant, maintenance costs, especially repairs to furnace refractories, were relatively low, while stoppages due to breakdown were minimized. On the other hand, it must be remembered that modern practice had made possible almost equally high efficiencies in stoker fired boilers.

The large combustion volumes apparently needed for pulverized fuel firing had, in the past, tended to militate against it, and much experimental work had been carried out to find the conditions necessary for combustion in the minimum volume. Several years ago some experiments had been carried out at the Fuel Research Station on burning coal in a simple turbulent furnace. While as a furnace the experiments were not entirely successful, the results showed quite clearly that pulverized coal could be burned in spaces much less than were considered necessary up to that time. The heat release amounted to 90,000 B.Th.U. per c.ft. per hour, as against a general designing figure of some 27,000 B.Th.U. at that time. Probably the highest figures obtained were those by Brookes at Fullerton, Pa., U.S.A., who made an attempt to simulate the action of the tornado; and it was interesting to note that the enormous figure of 1,100,000 B.Th.U. per c.ft. per hour had been obtained. By the adoption of this principle, reductions had been made in the furnace volumes of "well" type furnaces, and several installations of a design based upon this experimental work were in operation in the United States at the present time. It would not, however, be possible with the material available at the present time to approach anything like the figures obtained by Brookes, who considered that 100,000 B.Th.U. was probably the practical limit at present.

NEW DESIGN OF WASHER.

We are able to place before our readers a description of a new design of washer which has recently been installed at a number of works by the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., and which possesses many advantages. We are indebted to Mr. Arthur Roberts, Engineer and Manager of the Corporation Gas-Works, Hereford, for supplying the following tests and figures as taken at that works.

Little alteration in design of washers has been effected during the past fifteen years; but the new static type which is described here has many distinct advantages, especially when it is remembered that modern carbonizing methods have tended to the production of weak ammonia liquor, which in turn has reduced the profits of sulphate manufacture. If the weak liquor has been sold, then the profits have been swallowed in transit charges.

The new static washer produces stronger liquor than was formerly possible. The power consumption is much less, and a lower back-pressure is thrown on the gas exhauster. These advantages are obtained owing to the special contact packing material being showered with washing liquid at a rate equal to, or greater than, the flow of liquid through the machine. This is achieved by the special design of the washer. The reduction of power required is gained because only liquid is used as a means of scrubbing the gas, and this liquid is the only moving part in the washer. In many older types of washer, the whole internal parts are moved or revolved, causing higher power consumption. Reduction of back-pressure is due to the fact that the liquid moves through the filling material in the same direction as the gas, and so actually helps the passage of gas through the washer, though the liquid itself is flowing from compartment to compartment counter-current to the flow of gas.

The new washer seldom exceeds a height of 12 ft., and is thus easily accessible for examination on all its sides and on top. Suitable manhole doors are provided on each section, to allow the filling material to be removed and cleaned easily in one solid piece. The limited height is achieved by placing a number of compartments side by side. Each compartment has a downtake and an uptake. The downtake compartment is filled with the special packing material (fig. 3), and the uptake is provided to prevent entrainment of liquid from one bay to the next. The gas thus traverses the washer in a zigzag course.

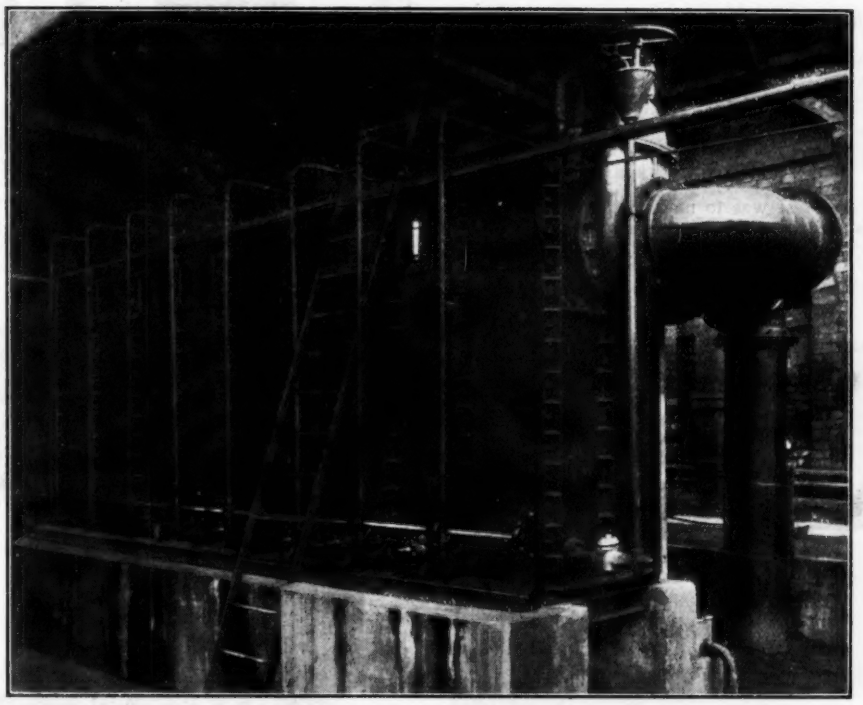


FIG. 1.—THE NEW WASHER AT HEREFORD.

Figs. 1 and 2 are pictures of the washer as it is working today at the Hereford Corporation Gas-Works (many others are at present in course of construction for naphthalene, benzole, &c., washing). At Hereford the washer has successfully treated per 24 hours 1¼ million c.ft. of gas containing 240 grains of

ammonia per 100 c.ft. It has reduced the ammonia content to below one grain per 100 c.ft. at the outlet.

Two tests have been taken over considerable periods; and the following tables show the results of two weeks' working:

Test Making Strong Liquor.

	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	
Gas inlet.									Gas outlet.
	24	18	14	10	9	7	5	2	
	25	20	15	12	10	4	2	0·5	
Liquor outlet.	24	20	15	12	10	1	1	*Nil*	Water inlet.
	Pressure thrown, total, three-tenths.								

Gas passed through washer per 24 hours, 900,000 c.ft.
Ammonia in inlet gas, 240 grains per 100 c.ft. (All other scrubbing plant was by-passed.)
Ammonia in outlet gas practically *nil*.

Test Making Ordinary 10 to 12 Oz. Liquor.

	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	
Gas inlet.									Gas outlet.
	11	7	5	3	2	0·5	0·5	*Nil*	
	11	7	5	3	2	1·5	*Nil*	*Nil*	
Liquor outlet.	12	7	6	3	2	1	0·5	*Nil*	Water inlet.

When making 12 oz. liquor, the last three bays were free from ammonia, showing that only six bays are really necessary for complete removal of the ammonia.

The following test was taken over a period of several hours, to obtain a representative sample of at least 100,000 c.ft. of gas. Clean water was employed in the washer. All the other purification plant was in use. The test was taken to demonstrate the efficiency of removing the last few grains of ammonia from the gas. This, as is well known, is difficult of accomplishment.

Results in Grains per 100 C.Ft.

Main inlet	6·8		
Outlet 1st chamber . . .	6·3		
Outlet 2nd chamber . . .	5·49	3·2	
Outlet 3rd chamber . . .	4·2	2·77	3·2
Outlet 4th chamber . . .	2·5	2·3	2·3
Outlet 5th chamber . . .	1·8		1·15
Outlet 6th chamber . . .	1·15		
Outlet 7th chamber . . .	0·7		
Main outlet	0·67		

The object of the first test was to make as strong liquor as possible without losing too much ammonia; and it will be observed that 24 oz. liquor was obtained by this washer when working on three-quarters load. The back-pressure was extremely low—namely, 3-tenths total. The ammonia content of the inlet gas was 240 grains per 100 c.ft.; that of the outlet gas, less than one grain per 100 c.ft. A test was taken to find out whether ammonia liquor was being entrained with the gas; and it was found that no liquor whatever was being so entrained, either from one compartment to the other or through the outlet end of the washer.

The second test was undertaken to ascertain the minimum number of bays necessary to achieve the standard results at present obtained by ordinary types of washers in use; and it was found that, while eight bays were provided at Hereford,

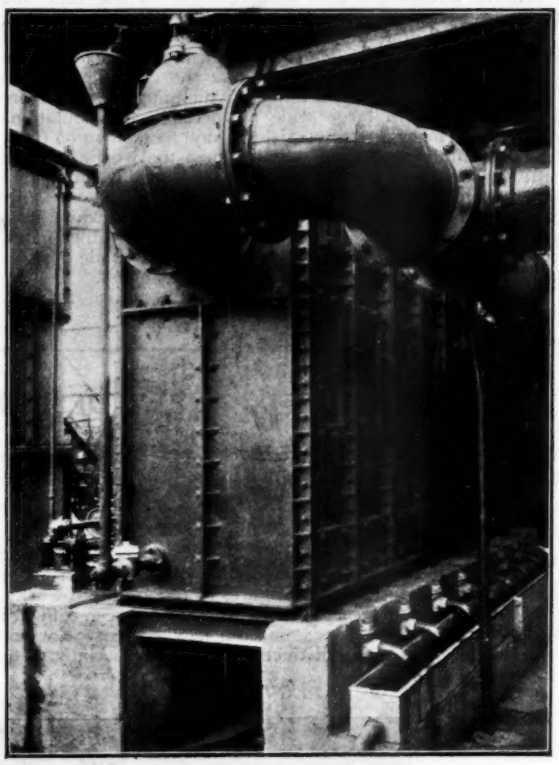


Fig. 2.—The End Elevation.

six bays only were actually necessary. Even so, the best results were obtained—namely, 12 oz. to 13 oz. liquor.

OPERATION OF THE SCRUBBER.

Each bay is provided with its own circulating pump, and its own spray, filter, liquor well, and packing tubes. The pump circulates the liquid from the well up to the spray, and down through the packing tubes into the well again. The best possible scrubbing surface is thus exposed to the gas as it traverses the packing tubes. The liquid travels in the same direction as the gas; thereby assisting the gas through the washer. Each bay is provided with an uptake chamber to pre-

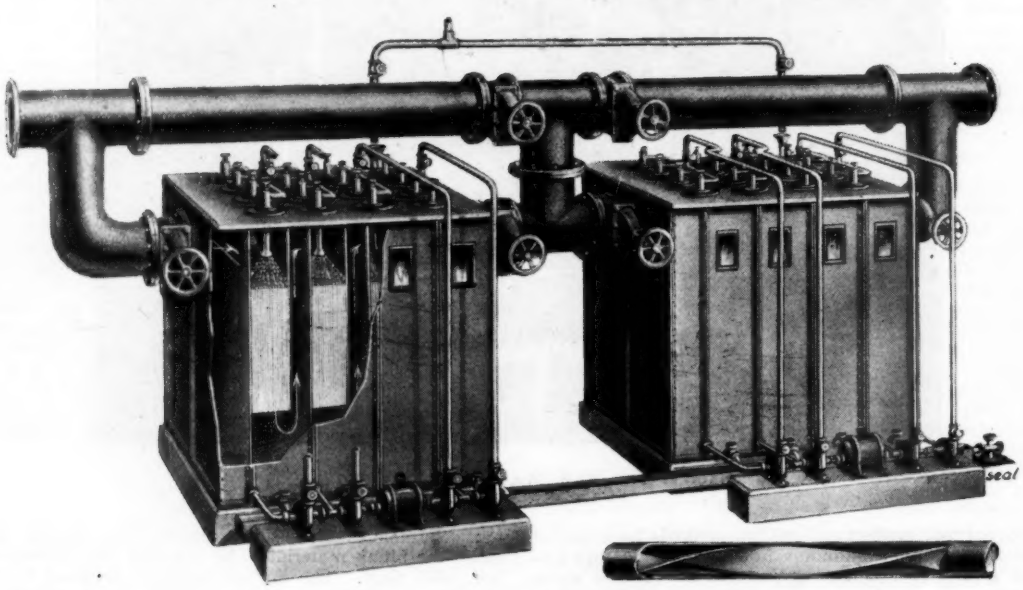


FIG. 3.—SHOWING A SECTION THROUGH THE APPARATUS.

vent entrainment from one chamber to the next; and on actual test it was found that no spray was contained in the gas after the latter had traversed 1 ft. of the uptake chamber.

The liquor from one bay overflows internally to the next bay, and so on throughout the washer; each bay having a separate pump, separate spray, and separate complete tube filling. The whole line of pumps is driven by one power unit—either steam engine, electric motor, or other suitable means. As there are eight bays to the washer, and one pump to each bay (each pump capable of delivering 900 gallons of water per hour), the actual power required will be 0·12 H.P. per pump, or 0·96 H.P. for the eight pumps. However, greater power is provided for reliability. The pumps are of the rotary type, and rotate at a speed of some 200 to 300 R.P.M. They are simple, and positive in action. Each pump can be disconnected from the range without shutting-down the remainder. The pump casing can be examined, and the impellers cleaned or repaired, in a few minutes at very low cost, and connected again without affecting the working of the washer. No noise whatever is noticeable, and the Engineer at the works was, soon after starting the plant, entirely satisfied with its operation.

The contact packing, which is—together with the design of the washer—the subject of various patents, can be easily removed by a manhole door which is provided on the side of the washer; and the operation of cleaning is extremely simple. The whole of the operation can be carried out at ground level. The sprays are also provided with a means of cleaning, which can be satisfactorily effected without shutting-down the washer in any way. These sprays are specially designed to be self-cleaning; and therefore the special method provided for cleaning them would hardly appear to be necessary. However, it is available in the event of any serious stoppage. A suitable number of sprays is provided in each chamber.

PRINCIPLE OF THE PACKING.

The stream of gas is cut up into hundreds of different small streams. The tubes are fitted with a corkscrew strip of metal. This cuts the core of each stream of gas down its centre, gives each stream a rotating motion, and throws the gas against the near surface of the tubes. The core is scrubbed by the strips. All moving parts are externally fitted, thus ensuring reliability.

The washer is for scrubbing the gas for ammonia, benzole, or naphthalene, or for dehydrating the gas. The engineer will be sure of extracting his ammonia in one-third the bulk of liquor at present used (depending on the quantity of virgin liquor). He will be able to extract, if he requires it, up to 97 p.ct. of the benzole from his gas, and all the naphthalene and water.

Many modifications in working become possible. One is the scrubbing of the gas with weak liquor produced from vertical retorts, extracting the remaining ammonia from the gas, and concentrating the weak liquor to a suitable point, for either working up to sulphate or selling to liquor distillers. With this procedure it is possible to tap the washer bays at any point. Thus fresh water may be used in a certain number, to ensure complete scrubbing. Moreover, the first two bays of a complete scrubbing outfit could be used for tar fog extraction. Where very small quantities of ammonia are found in the gas, the washer can be used as a combined ammonia and benzole extractor. In this case the first two bays are employed to extract the ammonia, and the remainder to extract the benzole. Such a system would be applicable to low-temperature processes.

If two washers of the double bay system are used similar to those at present installed, the second bay can be used for concentrating the liquor up to a greater strength than at present achieved. It will be easily seen that, by obtaining stronger liquor in gas-works, the ammonia could be despatched in smaller bulk; or if worked up to sulphate in a liquor still will require a proportionately less amount of steam to distil it than would be the case with the weaker liquor. In the same way, when benzole is extracted from the gas, the amount of power and heat required to debenzolize the wash-oil will be considerably reduced, providing a similar action takes place in the concentration of the benzole in the gas oil as is taking place in the ammonia washer.

Replacements, we understand, are extremely few, and are easily effected. The Chemical Engineering and Wilton's Patent Furnace Company, Ltd., are making preparations to provide these washers at short notice and at low cost.

NEW PLANT AT COLWYN BAY GAS-WORKS.

Inauguration of Glover-West Vertical Retort Installation.

On Wednesday, Jan. 30, at Colwyn Bay, about a hundred guests assembled at the Municipal Gas Works, and inspected with interest the Glover-West vertical retort installation, costing about £33,000, erected by Messrs. West's Gas Improvement Co., Ltd., Miles Platting, Manchester. In addition to members and officials of the Colwyn Bay Council, there were present representatives and gas engineers of practically all the North Wales local authorities, and some from Cheshire. Councillor John Holman, J.P., had been appointed to inaugurate a cycle of operations from coal tipping to extraction of coke, but, as the contract had been started and completed during Councillor E. Wilson's chairmanship, he called upon that gentleman to accept the honour.

Councillor H. Kyffin Jones, J.P., Chairman of the Council, presided at the subsequent luncheon at the Hotel Metropole.

Luncheon Speeches.

Mr. W. NEWBIGGING, M.Inst.C.E., proposing "The Council," said that if British resorts were alive to their own interests, they would no longer allow their towns to be covered by a pall of smoke. The public conscience must be aroused in this country as it had already been done in America and Switzerland, where the free burning of coal was prohibited.

The CHAIRMAN responded.

Councillor E. WILSON, who proposed "The Contractors," said the work had been completed to the satisfaction of the Engineer (Mr. James Smith), the Lighting Committee, and the whole Council. The question of smoke abatement was prominently before the minds of the Council when they decided upon the Glover-West vertical retorts.

Alderman F. J. WEST, C.B.E. (Chairman and Managing Director of West's Gas Improvement Company, Ltd., and ex-Lord Mayor of Manchester), in responding to the toast of "The Contractors," said he was fully confident that, with the technical skill and initiative of the Engineer, Mr. James Smith, and the able assistance of his staff and workmen, the working results of the new installation would secure substantial benefits to the ratepayers, and would reach the greatest possible efficiency. Speaking from a lifelong connection with the progress and development of the gas industry, Mr. West stated that he could not help being conscious of the fact that a vast proportion of the community was very ignorant of the use of gas, and the important contribution its bye-products make to commerce and industry in the shape of coke, tar, sulphate, dyes, and other commodities. There would appear to be a totally erroneous impression in many minds that the gas industry was a decaying one, and was being superseded by electricity. He did not wish to intrude on what might be a controversial question, especially in a locality where he believed gas and electricity, under the control of the District Council, were developing satisfactorily each in its respective sphere, but he felt the occasion was opportune for stating the position of the gas industry, and endeavouring to dispel some of the ignorance which prevailed in regard to it. In a recent tour round the world, from which he returned at the end of November last, and during which he visited Australia, New Zealand, Canada, and America, he found the same ignorance prevalent, despite the fact that in those countries the gas industry was progressing on a basis comparable with that of this country. The steady increase in the demand for gas, and of its application in all directions for domestic purposes, particularly heating and cooking, was more especially remarkable in districts where, as at Colwyn Bay, the electrical supply was in the same hands as that of gas. At Colwyn Bay they had water power directed to the generation of electricity; the vast undertaking of the North Wales Power Company was performing a great service in harnessing the forces of nature to supply the needs of man, and rightly so. But, at the same time, the convenience and economy of gas, particularly for heating and cooking, secured it a steady increase, even in places where electrical competition was the keenest. It had been said, and he believed it was substantially true, that the consumption of gas per head of population was greater in New York and Chicago than it was in London, Birmingham, or Manchester.

In spite of the comparative stagnation in trade through which this country was passing to-day, the growth of the demand for gas maintained its upward trend. True, the phenomenal increases during the coal stoppage year had not been maintained. That was not to be expected. But, according to the last figures, the annual make of gas for the year had increased throughout the British Isles by the stupendous figure of 3600 million c.ft. over the previous twelve months' make. The increase in the annual make for the year just ended was, in the British Isles, 18 p.ct. above that in the year 1923—an average increase of about 2½ p.ct. per annum. He saw that the increase during the last year in Colwyn Bay was no less that 14 million c.ft.—or about 7 p.ct.—a figure which had amply justified their Engineer in putting down the plant which had been inspected that day.

"Already," continued Mr. West, "the specified number of therms per ton have been delivered to Mr. Smith's satisfaction. But perhaps the most important feature of the continuous vertical retort for a situation such as you have in Colwyn Bay is its contribution to smoke abatement. You could not afford to put down in Colwyn Bay a plant which, every time it was charged with coal, emitted clouds of smoke to disfigure the sky and the scenery, to enjoy which the visitor has left his home in Manchester or Liverpool, or some other large town. The ratepayers of Colwyn Bay are to be congratulated upon possessing a gas undertaking which suggests a progressive policy and efficient management. The consumption per consumer compares more than favourably with other towns similarly situated, and at a price which compares equally favourably with that charged in other towns."

Councillor JOHN HOLMAN, submitting the toast of "The Gas Industry," spoke of its manifold national, industrial, and social services in war and peace.

INSTALLATION OF "W.-D." CONTINUOUS VERTICALS AT THE SALTLEY GAS-WORKS.

By T. A. HARVEY, O.B.E., Retort House Superintendent, Saltley Gas-Works, Birmingham.

[Read at a meeting of the Midland Junior Gas Association, Birmingham, on Jan. 31, under the presidency of Mr. F. Caudwell, of Shrewsbury.]

It is my privilege, in this paper, to give you some details as regards construction, operation, and results of one of the most up-to-date carbonizing plants yet built—namely, the new installation of Woodall-Duckham continuous vertical retorts which has recently been put to work at the Saltley Works of the Birmingham Corporation Gas Department.

CHOICE OF PLANT.

When the Birmingham Corporation Gas Department had to face the reconstruction of their Saltley Works, many systems of carbonization were carefully examined. After much consideration, the decision was made to replace two ranges of inclined retorts by a battery of the latest type of Woodall-Duckham continuous vertical retorts. In coming to their decision, the Gas Department gave consideration to the comparative performance and figures of various types of plant in relation to such factors as:

(1) The output of gas per square foot of ground space.
(2) The production of gas of the required calorific value.
(3) The make of gas per ton of coal carbonized.
(4) The flexibility of the plant as regards calorific value, gas output, and types of coal which could be treated.
(5) The fuel consumption per ton of coal carbonized.
(6) The capability of the producers to burn coke breeze.
(7) Labour requirements.
(8) Coke quality.

At a later stage in this paper, it is proposed to discuss the extent to which the new installation has met the requirements laid down in the original choice of plant. In the case of the Birmingham Gas Department, this type of plant was, of course, not a plunge in the dark, as already nearly 3000 tons of coal per day are being carbonized in eight installations of Woodall-Duckham continuous vertical retorts in the various Birmingham gas-works.

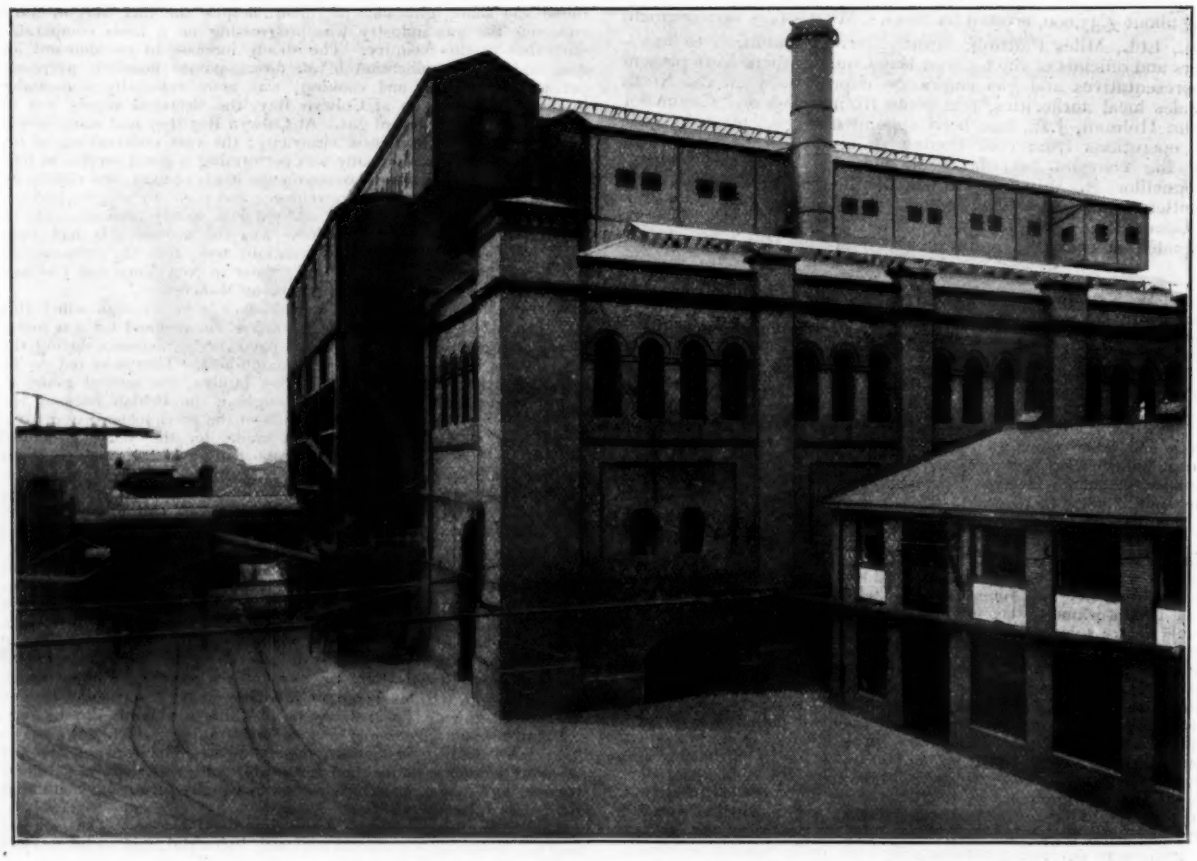
THE SALTLEY INSTALLATION.

The carbonizing plant consists of a battery of 56 continuous vertical retorts, each with a throughput of 8 tons of coal per day, heated by two batteries each of 5 producers, built away from the retort bench but connected thereto by means of a common producer gas main. The waste gases from the battery of retorts are collected in a common collecting main, and pass to the waste-heat boiler plant. The battery is of the non-recuperative type, and thus the waste gases pass to the waste-heat boilers at a higher temperature than with the older recuperative type.

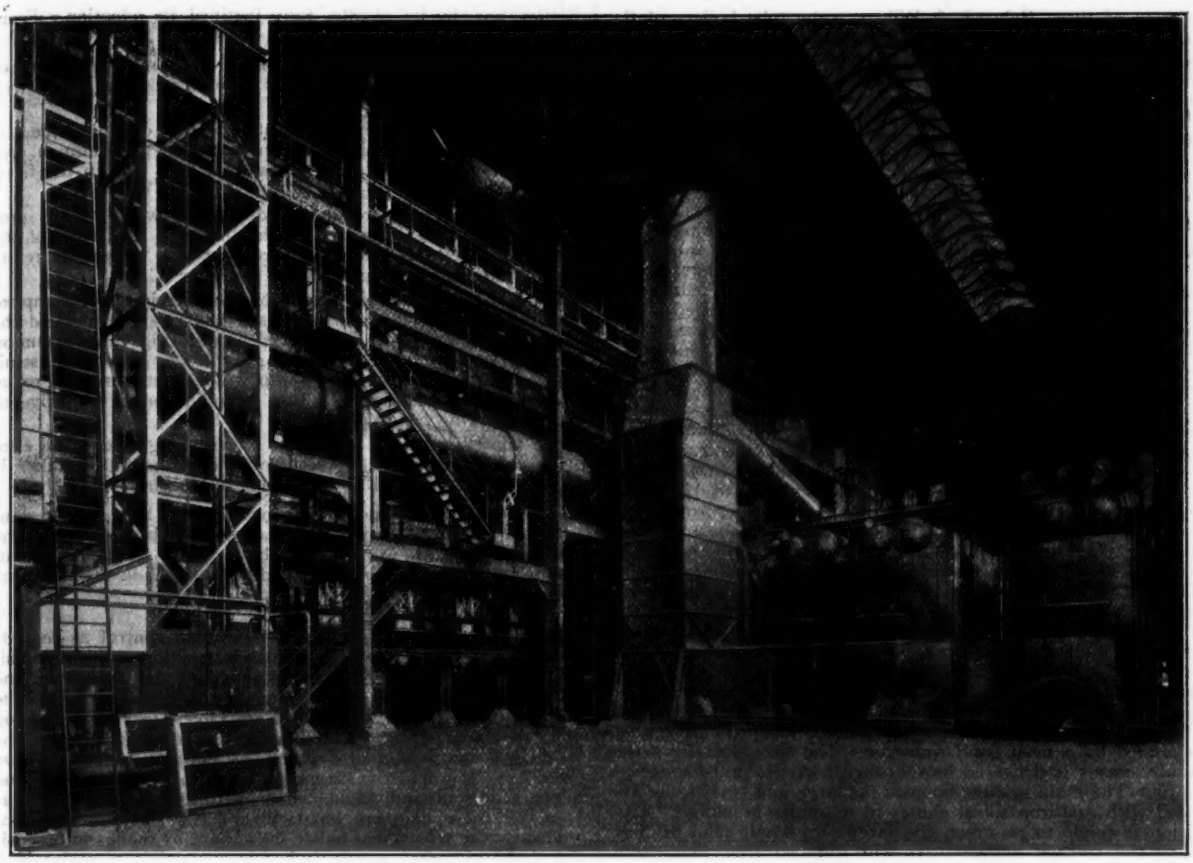
COAL HANDLING AND BLENDING PLANT.

The coal handling and blending plant may be regarded as being an entirely new feature in gas-works practice, in that there is provided a concrete blending hopper of a capacity of 2000 tons. This hopper is divided into four sections, so that, when desired, the different qualities of coal may be blended, in order to give a homogeneous mixture before delivery into the retort bunkers. The wagons of coal, when they enter the works, are emptied by means of a rotary tippler into the receiving hopper. From the latter the coal is fed on to an inclined tray conveyor capable of dealing with 100 tons of run-of-mine coal per hour. The coal passes through a special type of crusher, known as the Norton, and then, by means of gravity-bucket conveyors, is raised to the top of the blending hoppers, where it is distributed by fixed tipping dumpers and chutes into one of the four sections of the main blending hopper, or, alternatively, when required, fed on to the tipping tray conveyor which distributes it direct to the retort overhead bunkers. Each of the four sections of the blending hopper is fitted with adjustable outlets so designed as to allow any required amount per hour from each section of the blending hopper to pass directly into a gravity lip-bucket conveyor which takes the blend of coal up again to the level of the overhead storage hoppers above the retort bench, and there feeds it on to a 100-ton per hour tipping tray conveyor which discharges it by means of a travelling dumper into the various bays of the hoppers.

The coals entering the works are divided approximately into



VIEW OF THE RETORT HOUSE.



VIEW OF THE NEW PLANT.

four groups; each group being elevated to separate sections of the blending hopper. The four groups are:

(1) Ordinary Derbyshire coal.
(2) Good working Yorkshire coal.
(3) New Hucknall and good Derbyshire coal.
(4) Rich Yorkshire and sticky coal.

By knowing, as far as possible, the relative quantities of these various classes elevated, one is able to deliver a uniform mixture to the bunker over the battery of retorts. Though it has not yet been possible to blend coal to as great an extent as was hoped for, owing to erratic deliveries from various collieries, yet this method has resulted in more regular working, while the coke discharged has been very uniform, as recorded by weekly measurements of unscreened coke, which has averaged 31 to 32 hectolitres per ton for large coke, and 29 to 30 hectolitres per ton for small coke. In addition, the ash contents of the breeze and the coke have been very uniform. By means of these arrangements of coal storage, and with a greater measure of uniformity of supply, we believe that there are great possibilities of improving the general quality of the coke, and also of ensuring better retort working and more regular calorific value of the gas made.

NORTON COAL BREAKER.

A special crusher has been installed with the object of producing coal not greater than 3-in. cube, but without causing the formation of excessive amounts of fine dust, which militates against the regular working of the plant under steaming conditions. The Norton crusher consists of a plate conveyor on to which the coal to be crushed is fed, while a plate of $\frac{3}{4}$-in. cast steel, fitted with vanadium steel picks of 2 in. top diameter, spaced at 2 in. intervals, is raised and lowered by an eccentric gear to within 2 in. of the surface of the conveyor, thus enabling the picks to split-up the coal to 3-in. cube without crushing. For each revolution of the driving gear, the plate conveyor is pushed forward 15 in. by an eccentric coupling. The coal is discharged, at the turning-point of the conveyor, into the chute feeding either of the two gravity-bucket conveyors.

THE BATTERY OF RETORTS.

Each retort in the battery is under independent control, being provided with its own producer gas, secondary air, and waste gas flue dampers, and thus forms a complete heating unit. The retort faces and the combustion chambers are built of first-class silica brick for the full depth of the combustion chambers. To provide means of varying the temperature at the top and bottom of the combustion chambers, additional secondary air inlets, controlled by separate dampers, are provided. In passing, it may be stated that this additional supply of secondary air has proved in practice to be of considerable value. Both the side walls and the top of the bench are faced with hollow blocks packed with slag wool. Outside these blocks on the side walls, for some distance down, is laid a thick coating of insulating material, to reduce heat loss through radiation to a minimum. The setting brickwork is strongly braced.

From each retort a 9-in. offtake pipe passes at one end of the retort mouthpiece into a collecting main common to fourteen retorts. A drop valve, of the mushroom type, is provided, on the inlet to the main, with a cleaning door opposite the sloping section of the pipe. Each collecting main, which is fitted with liquor feed and cleaning boxes, passes into a 21-in. foul main. The gas is sprayed by three umbrella type sprays in a vertical portion of the main, and then passes through a butterfly valve which controls the pressure of the gas at the retort offtakes by means of an " Askania " governor.

PRODUCERS.

A regular supply of good producer gas is essential to obtain satisfactory working results on any carbonizing system. In this installation the heating of the battery of retorts is carried out by means of two batteries of step-grate producers, each consisting of five separate units. The producers are designed to operate on screened coke breeze with a grading of $1\frac{1}{2}$ in. to $\frac{7}{16}$ in.; and for this reason grate area was provided to the extent of 1·5 sq. ft. per ton of coal carbonized per day. About 2 ft. above the ground, venturi tubes are built into the back of the producers, from which steam-air ducts are built with openings into the front of the firebars on either side of the grate of each producer. Each opening is controlled by an adjustable sliding door. The producer brickwork is strongly braced. The side, back, and front brickwork is covered with a layer of Moler insulating bricks. Over the producers is erected a long feeding bunker (capacity, 48 hours' supply) with outlet chutes over each charging door.

The producer gas is led by uptake pipes into a common distributing main which extends the whole length of the retort bench and is built up of mild-steel plates lined with 3 in. of insulating brick and $4\frac{1}{2}$ in. inner lining of firebrick. A rectangular header leads the producer gas from this main into every pair of retorts. Cleaning doors have been provided opposite each header.

WASTE-HEAT BOILERS.

The gases from the waste gas collecting main pass into a

battery of three Babcock & Wilcox water-tube boilers of the latest type, fitted with superheaters. The boilers produce 20,000 lbs. of steam per hour at a pressure of 135 lbs. per sq. in. with a superheat of 100° Fahr. when operating two of the boilers and one acting as stand-by. The boilers are coupled at their outlet to turbo-driven fans which deliver the waste gases into a chimney by means of a common main.

COKE HANDLING AND SCREENING PLANT.

In the new Saltley installation particular attention has been paid to the design of the coke handling and screening plant. The coke is discharged from the receiving hoppers into skips placed on one of two electrically-driven chassis, and travels to the end of the retort house. At this point, the full skips are raised by an electric telpher, and the coke is discharged into a receiving hopper situated near the retort house roof. The telpher is operated by push buttons from the retort house floor level. From the overhead hopper, the coke is delivered by reciprocating feeders into either of two primary screens of the rotary type arranged for separating it into three sizes—namely, breeze, all under 1½ in.; small coke, over 1½ in. and under 2¼ in.; large coke, all over 2¼ in. The large coke is transported from the primary screens by an 18-in. belt conveyor to the large storage hopper. The small coke, 2¼ in. to 1½ in., is transported by means of an inclined band conveyor, working in conjunction with a shuttle band conveyor, into a storage hopper. The breeze passes through chutes into secondary screens, in which the material below $\frac{7}{16}$ in. is screened out. The screened breeze, 1½ in. to $\frac{7}{16}$ in., is carried by band conveyors either to the hoppers arranged above the producers, or to a further screen which separates the material above ¾ in., and thus divides the screened breeze into two fractions—1 in. breeze (1½ in. to ¾ in.) and bean breeze (¾ in. to $\frac{7}{16}$ in.), which fractions are delivered to separate storage hoppers. The screened breeze for the producers is distributed over the length of the producer coke hopper by an automatic shuttle band conveyor fed by a fixed band conveyor. The coke dust from the small screens is delivered into storage hoppers by a band conveyor. The main storage hoppers for large and small coke are fitted with cast-iron spiral chutes to minimize breakage. Provision is made to re-screen the large and small coke as they leave the storage hoppers. It will thus be seen that every effort is made to ensure that the purchaser of a screened coke does, in fact, receive the size he asks for.

OPERATING EXPERIENCE.

The ultimate tests of any new design of carbonizing plant are twofold—first, the results obtained, and, secondly, the way the plant responds to the demands of the operator.

The following table shows six months' working results on the new Saltley plant. The figures are divided into two 3-month periods. The first covers the settling-down period of the new plant, and the second three months may be regarded

Six Months' Working Results on the Saltley Installation of "W-D" Continuous Vertical Retorts.

—	3 Months to Sept. 30, 1928.	3 Months to Dec. 31, 1928.	6 Months to Dec. 31, 1928
Total coal carbonized, tons	29,743	36,155	65,898
Total coal carbonized per day, tons	327	397	362
Average throughput of coal per retort per day, tons	6·7	7·9	7·36
Calorific value of gas made, B.Th.U. per c.ft. (60° Fahr. and 30 in.)	481	479	480
Gas made per ton of coal, c.ft. (60° Fahr. and 30 in.)	16,690	16,639	16,666
Therms per ton of coal	80·3	79·7	80·0
Total gas make per day, c.ft.	5,560,000	6,630,000	6,100,000
Percentage steaming on weight of coal	20	18·5	19
Screened breeze used as fuel per ton of coal carbonized, p.ct.	14·1	12·5	13·3
Coals used	Mixed Yorkshire and Derbyshire	Mixed Yorkshire and Derbyshire	Mixed Yorkshire and Derbyshire
Remarks	Plant started gas-making May, 1928	..	..

as normal full-speed operation. Taking into consideration the fact that the plant only started gas-making in May, 1928, these 6-months' figures may be regarded as thoroughly satisfactory.

OPERATION.

The new installation has shown itself exceptionally responsive to the hand of the operator. In this connection the writer would mention five features.

(1) PRODUCER CONTROL.

The provision of outside producers has from time to time been a source of much controversy, but the type installed at Saltley has, by its results, fully justified its adoption. From the point of view of the operator, the special points are:

(1) Any one producer is capable of being shut out without reduction of throughput of a single retort in the battery of retorts.

(2) Gases are transferred almost free from dust into the setting; the dust coming down either in the common producer gas main or in the special dust trap in the front wall.

(3) Though there are these advantages with outside producers, yet, by reason of the thorough insulation of the producer gas main, the producer gas enters the retort setting at a temperature of 800°-850° C.

(4) The steam and air supply to the fires is under complete control. Steady steam pressure on the firebars and the air venturi tubes is obtained by reducing valves common to a battery of producers; while, by means of semi-circular covers on the venturi tube inlets, an even make of good producer gas can be relied on, irrespective of changing conditions of the fuel bed.

(5) The temperature of the fire is easily regulated; and even when burning all breeze, practically no hard clinker is formed under these conditions of working.

The writer has found that in practice the best results seem to be obtained by keeping level gauge to slight pressure of the air-steam mixture in front of the firebars. The amount of steam required is 0·5 lb. per pound of fuel used in the producer.

(2) HEATING CONTROL.

The new plant has shown itself easy to control as regards heat regulation. The vertical flue construction makes it possible to inspect the heat of the combustion chambers from one level, which is of great advantage on a large battery. The average temperatures maintained are 1400°-1425° C. at the top and 1100°-1150° C. at the bottom of the combustion flues. The waste gas dampers on the waste gas side of the battery have been used in practice to do most of the final regulation of flue temperatures on individual retorts. Adjustments as small as ¼ in. on these dampers have effect. The stack pull is controlled by the waste-heat boiler fans; and, by means of a sensitive drum recording gauge, it has been possible to maintain a steady pull of $\frac{50}{100}$ in. The effect of high gales and sudden gusty winds is greatly reduced by two counterpoised vanes, about 9 in. square, set at the bottom of the chimney on either side.

Control of heating is simplified by the fact that accurate pressure recorders are provided for both producer gas and stack pull. The "Arcon" pressure gauges on the producer gas main can be read to $\frac{1}{100}$ in.

Temporary Shut-Down of Plant.

The method of shutting-down the plant for a temporary period of (say) 24 hours (*e.g.*, Christmas) which has been found possible on this new installation will show perhaps more than anything else the satisfactory way in which the battery as a whole responds to alteration. Briefly, the method is as follows:

To shut down, firing on the producers is stopped. The venturi steam and retort steam are turned off, and gradually all air to producers is stopped. The stack pull is reduced to 4-tenths by slowing the fans. The auxiliary coal bunkers are filled up, and the extractor engine is stopped. The exhauster is then stopped, and 3-tenths pressure kept in the gas collecting main by opening the blow-off valve. No individual dampers are touched, and it is found that the heats are maintained at 1250°-1350° C. at the top and 1050°-1100° C. at the bottom.

To start up, the producer fires are broken up during one shift before gas-making is to restart. Four hours before gas-making is to restart, one-half normal steam supply to the producers is turned on, and the stack pull gradually increased. This quickly brings up the heats. To begin gas-making, all the retorts are rodded, and the extractor engine is started up at slow speed. Then steaming of the retorts is commenced, 5 lbs. at a time. The gas main valve is opened, and the blow off valve closed as pressure rises. Finally, the exhauster is started up. Full make is obtainable six hours after starting up.

(3) SCURFING.

It is found that a regular scurfing cycle ensures steady working of the plant. The usual procedure is to scurf four retorts and work fifty-two retorts, which amounts to 7 p.ct. of the plant off for scurfing. In the case of a retort working badly before it is time for it to be scurfed, any single retort can be scurfed under conditions of exact temperature control, for each retort is a separate heating unit. In a large battery such as that at Saltley, in order to improve working conditions for the men, we usually scurf the retorts in blocks of four.

(4) STEAM QUENCHING OF COKE.

When making 475 B.Th.U. gas, we have found that the amount of steam introduced for water gas production is normally sufficient to quench the coke without the addition of any water. The steam is led into the retort through the curved plate of the coke extractor box. The normal supply of steam

is equal to about 20 p.ct. of the weight of coal. When the amount of steaming falls below 11 p.ct., we find it necessary to use water sprays in addition, to ensure sufficiently cool coke. Steam quenching allows the coke to leave the retort house dry, and merely warm. With our normal operation (20 p.ct. steaming), we find that steam quenching seems to give a greater yield of large coke, and, contrary to expectations, even with high throughputs the bottom castings do not get unduly hot.

(5) Crude Gas Governing.

In continuous vertical retort operation an important feature is to maintain level gauge at the retort mouthpiece. In a large battery of retorts this is no easy matter, but at Saltley accurate gas governing is obtained by dividing the gas stream into four sections, each taking the gas from fourteen retorts. In each of these crude gas streams the pressure is governed by a butterfly valve controlled by the "Askania" regulation equipment. This, together with recording and dead-beat gauges reading to $\frac{1}{20}$ in., makes it possible to maintain level-gauge working at the retort mouthpieces of the whole battery.

Output of Gas per Square Foot of Ground Space.

The great increase in demand for gas in Birmingham made it necessary to consider which plant would give the maximum output of gas per square foot of retort house area. In this direction, the new installation is an advance over any previous plant built at Birmingham. This may be demonstrated by the fact that the new plant, which has a capacity of 7 million c.ft. of gas per day, could have been installed on the site of the dismantled beds of inclined retorts, which were capable of turning out $1\frac{1}{4}$ million c.ft. of gas per day, and which occupied half the retort house. In other words, if ground space had been the supreme factor, we could have installed over five times the gas-making capacity of the old plant in the same retort house. Actually, it was not considered desirable to put in the maximum carbonizing capacity in the retort house; and a carbonizing plant, together with a large waste-heat boiler plant and blending hoppers, was spread over the old retort house, which had a total output of $2\frac{1}{2}$ million c.ft. of gas per day. Even under these conditions, in which there is a large amount of free space, the output is three times that of the old retort house.

Production of Gas of the Required Calorific Value.

When contemplating the extension, the Gas Department had to consider that it was their policy to deliver to the town 475 B.Th.U. gas. Based on their previous experience, they had found it a simpler proposition to make the bulk of their gas of the quality they wished to send out, rather than to mix water gas with straight coal gas in order to produce the gas of required calorific value. For the production of 475 B.Th.U. gas in a one-stage process, the continuous vertical retort has no equal. Throughout its six months' operation the new installation has consistently made 480 B.Th.U. gas with very little variation in quality from day to day.

Make of Gas per Ton of Coal Carbonized.

Especially to an undertaking where all coal is rail borne, the maximum thermal yield per ton of coal carbonized is of great importance. The new plant was guaranteed to produce 80 therms per ton of coal carbonized at a calorific value of 475 B.Th.U. per c.ft.; and, as the figures in the table show, it has produced 80 therms per ton of 480 B.Th.U. gas for the past six months.

Flexibility.

In considering any carbonizing plant, it is naturally of interest to a gas engineer to feel that his plant has a high degree of flexibility as regards calorific value, gas output, and the types of coal he can treat. Since this new installation has been put to work, we have found its degree of flexibility of great value. We find that the calorific value can be maintained constant by alteration in the extent of steaming. We have, in addition, found the plant particularly amenable to changes in output as may be demanded by local fluctuations, due to circumstances outside the control of the gas undertaking. By the simple alteration of the speeds of the extractor driving engine and the waste-heat boiler fan, the output of the plant may be altered over wide limits.

Fuel Consumption.

Experience has led us to believe that continuous vertical retorts produce a gas of calorific value of 475 B.Th.U. per c.ft. with a high degree of thermal economy. Using screened coke breeze of size $1\frac{1}{2}$ in. to $\frac{3}{4}$ in. in the producers, six months' operation on the new installation has shown a fuel consumption of 13·3 p.ct. on the weight of coal charged—or, in other words, 298 lbs. per ton of coal carbonized. This figure is all the more remarkable when taking into consideration the fact that the setting is of a non-recuperative type, and that for every pound of coke put into the producers, 5 lbs. of steam (from and at 212° Fahr.) is produced in the waste-heat boilers. Thus, for every ton of coal carbonized, 1490 lbs. of steam is produced. If we regard 8 lbs. of steam to be equivalent to 1 lb. of coke, then 1490 lbs. of steam are equal to 185 lbs. of coke. From this it follows that the net fuel consumption, which may be defined as coke charged to producers *less* coke equivalent of steam made from waste gases, is 298 *minus* 185, which is equal to 113 lbs. per ton of coal carbonized, or 5 p.ct. of the weight of coal.

Producer Fuel.

It has for some years been the policy of the Birmingham Gas Department to sell their coke carefully graded into the various sizes. It is obvious that some grades have an easier market than others. The new plant at Saltley was designed to use screened coke breeze as fuel in the producers; and throughout the past six months, coke breeze of size $1\frac{1}{2}$ in. to $\frac{7}{16}$ in. has been continuously employed in the producers. This has been made possible by reason of the ample grate area of the producers, and the arrangements provided for the introduction of air-steam mixture under very slight pressure below the bars of the step-grates.

To sum up, the working of the new plant has fulfilled expectations. A maximum make of 7,450,000 c.ft. per day has been obtained, while over the six months the gas yields have averaged 80 therms per ton, including two shut-down periods. The throughput has reached 8 to 8·3 tons per day. The conditions of heats have been very even throughout the plant, mainly owing to the ease with which the quantity and quality of producer gas are controlled, even when using breeze. The fuel figure over the six months is below that guaranteed, and the coke above $1\frac{1}{2}$ in. mesh available for sale has been over 50 p.ct. of the weight of coal carbonized.

In the course of a short paper, it has been difficult to outline even the outstanding points of this reconstruction work at Saltley; but the paper will have served its purpose if it has justified in your view my claim that the new continuous vertical retort installation constitutes one of the most up-to-date carbonizing plants yet built.

Vote of Thanks.

The Chairman observed that the thermal efficiency of most modern types of carbonizing plant reached 85 p.ct., which indicated the progress that had been made in carbonization. The description of the plant was most interesting. It was apparent that the question of the blending and the preparation of the coals used had received careful consideration.

Mr. W. MacNaughton (Wolverhampton) in proposing a vote of thanks to Mr. Harvey, congratulated him upon his contribution. He suggested that the fuel figure was rather high.

Mr. A. R. Myhill (Nechells), in seconding the vote, commented upon the change-over in the new equipment in regard to the position at which steam was introduced.

The resolution was passed, and Mr. Harvey replied.

Dr. E. W. Smith (Woodall-Duckham Companies) said that his firm were very proud of the plant. They owed much to Birmingham's keenness, technical capacity, and engineering foresight. Personally, he would always be against endeavouring to blend coke breeze with coal for continuous carbonization. The alteration in the point at which steam was introduced was well justified.

Mr. A. W. Smith (General Manager and Secretary of the Birmingham Gas Department) pointed out that the new installation embodied many novel features.

Mr. J. Foster (Engineer-in-Chief, Birmingham Gas Department) said that when the installation was started last April, they decided that it should be worked quietly. The time then was a difficult one for the selling of coke. It was October before they worked their full throughput; and he thought the results were satisfactory. He felt that the future would see developments in the use of total gasification plants together with low-temperature carbonization plants. With regard to the blending of coal, Mr. Foster pointed out that in a place like Birmingham they were obliged, owing to the enormous consumption, to take many classes of coal, which varied widely in character. Consequently, difficulty was experienced in regulating the heats and in obtaining the right quality of coke. Coal blending was therefore adopted.

Mr. T. Hack (Saltley Works) described the plant as unique in many respects. As regards ground space, the new installation was occupying just about one-fourth of the area taken up by the inclined retorts. With the improved plant, many might have thought they would have got something better than 80 therms. They had, however, purposely kept the heats down. His own advice was not to work a new plant at full capacity immediately, at any rate not for the first nine months. The fuel consumption was a remarkable one for 1-in. to $\frac{1}{2}$-in. breeze. He thought they would probably average somewhere about 9 p.ct. or 10 p.ct. They were also recovering much in the form of steam. The quality of the coke was exceptionally good. He gave a cordial invitation to the Association to inspect the plant.

The Chairman replied that the Association would be glad to visit Saltley.

Mr. E. B. Tomlinson (Nechells) stated that at the Nechells Works they steamed to the extent of 12 p.ct.; and to this must be added the steam which rose from the coke extractions, due to the water used for quenching purposes. This probably increased the amount of steam to about 17 p.ct. He thought the new method preferable to that adopted with the retorts at Nechells, where water was used for quenching, and where superheated steam was admitted to the retorts at a higher level. It was their intention to experiment with steam quenching in the lower part of the retort, supplemented by superheated steam at a higher level. It was important to bear in mind, however, that one could not dogmatize in these matters. Every case must be dealt with on its merits.

Mr. R. M. Greaves (Shrewsbury) expressed disappointment that there was not a bigger thermal yield of gas. There seemed little doubt, however, that when the plant was worked at its full capacity, the results would be much better.

THERMAL INSULATION (WITH ESPECIAL REFERENCE TO DOMESTIC HOT WATER SUPPLY INSTALLATIONS).*

By C. A. MASTERMAN, B.A., A.I.C. (of the Technical Staff of Watson House; Gas Light and Coke Company).

Paper before the London and Southern District Junior Gas Association on Jan. 25.

(*Continued from p.* 287.)

EXPERIMENTAL RESULTS.

A number of possible lagging materials were chosen, and preliminary trials were made with small canisters containing hot water. The less suitable materials were thus eliminated, and some information for purposes of comparisons was obtained as regards others for which full-scale tests were impossible. An asbestos cement, asbestos millboard, cellular asbestos, and hair felt were chosen for full-scale trials on boilers and hot water installations. Full information was obtained about the set when unlagged, and its subsequent behaviour after lagging was observed, with all other factors kept constant so far as possible. The boiler of the set was run until the contained water approached maximum temperature (*i.e.*, when thermostat shut down). Immediate drawing off to cold with evaluation of the heat content of the water gives, with the heat value of the gas burned, a ratio which determines the nominal boiler efficiency. The same routine was repeated, allowing various periods of time to elapse between turning off the gas and drawing off the water. In each case a figure may be calculated corresponding to the nominal boiler efficiency, the value clearly being the lower the greater the delay before drawing down. Then working backwards from this nominal efficiency figure it is possible to calculate what the heat content of the water would be at these stated times after a standard amount of gas has been consumed.

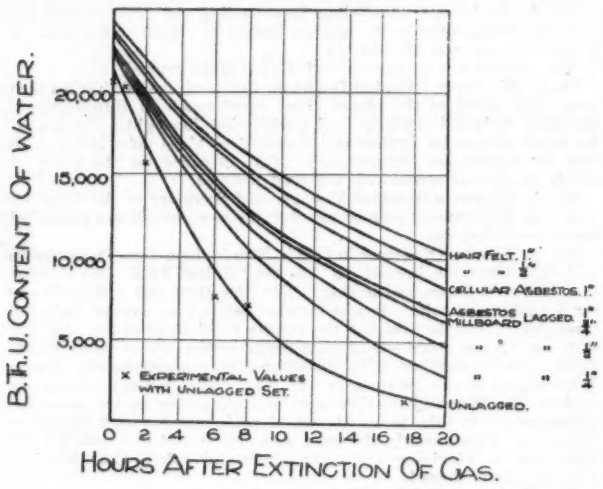


Fig. 3.—Change in Heat Content of Water with Lapse of Time after Extinction of Gas (Set A).

Fig. 3 shows graphically for an unlagged set a number of such points. The nearest theoretically derived cooling curve to these points is then drawn in as shown, and this curve is used for subsequent calculations. This same figure shows a number of other cooling curves for the same set under various degrees of lagging. The effect of lagging thickness is clear, as is also the contrast between the several lagging materials.

Fig. 4 shows similar curves derived from a different set, and the effect of different finishes upon the thermal insulation is very apparent. This effect, however, would certainly be less if applied to lagging of a higher degree of efficiency.

The apparently involved method of arriving at the cooling curve for the installation is adopted to minimize the effect of variable factors which cannot easily be avoided in a practical test.

* Line 15 *et seq.*, p. 286, "JOURNAL" for Jan. 30, should read:

From (2) $t_1 = \frac{Q + NTA\,t}{NTA}$

Hence $\frac{KAT\,t_2 - dQ}{KAT} = \frac{Q + NTA\,t}{NTA}$

$Q = \frac{NKAT\,(t_2 - t)}{Nd + K}$

The curves in fig. 5 are derived from a pair in fig. 3 by using the experimentally determined boiler efficiencies. Before any mathematical expression can be derived for application to the effect of lagging upon the household gas consumption, further

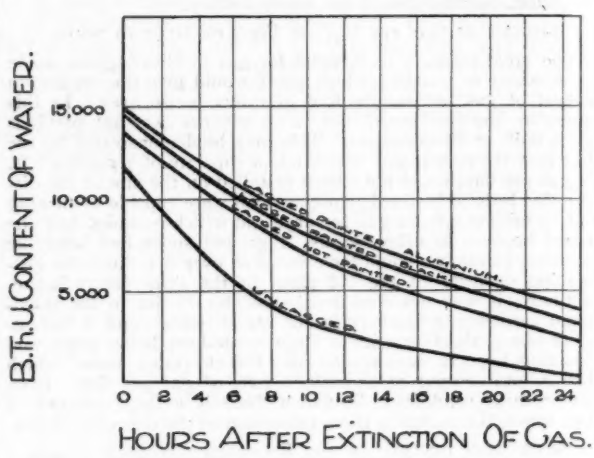


Fig. 4.—Change in Heat Content of Water with Lapse of Time after Extinction of Gas showing Effect of Finish (Set B). Lagging 1 in. Asbestos Cement.

tests must be carried out to determine the heat content of various amounts of water drawn from the set in the lagged and unlagged condition.

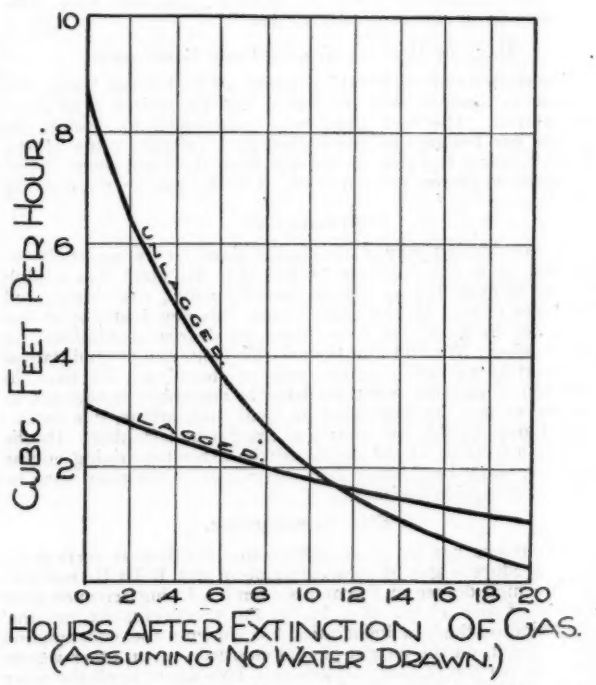


Fig. 5.—Relation Between Time Elapsing after Extinction of Gas and Rate of Heat Loss Expressed as the Gas Rate Required to Compensate (Set A). Lagging 1 in. Cellular Asbestos.

A pair of such curves is reproduced in fig. 6, and the distribution of heat in the water is seen to be not widely different in the two cases. (This it not always so, the lagged set show-

ing a much higher mean heat content under certain conditions.)

A final set of curves may be derived from these two fundamental sets (fig. 3 and fig. 6), and in fig. 7 such curves are shown for a set unlagged and when lagged with 1-in. thick cellular asbestos lagging. These curves show the amount of

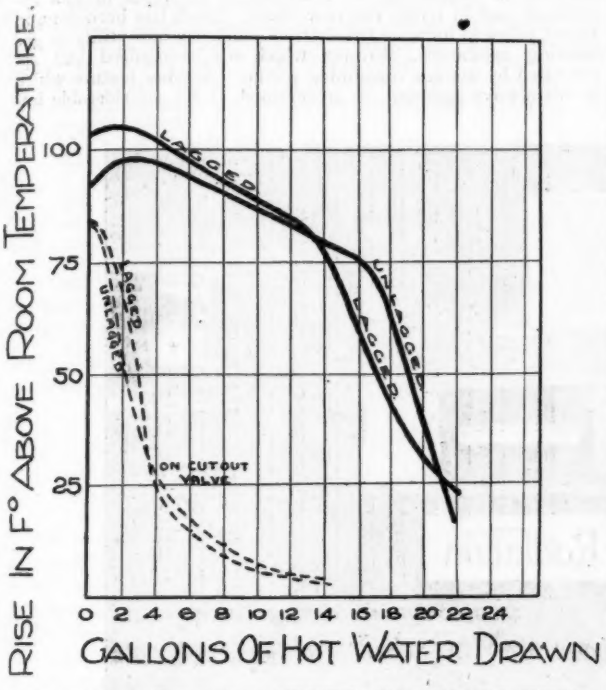


Fig. 6.—Varying Temperature of Hot Water Drawn from Sets Initially at Maximum Temperature (Set A). Lagging 1 in. Cellular Asbestos.

gas required at normal gas rate to restore the heat content of the water to its original figure, either after the stated period of cooling without the gas alight or after the stated amount of water has been drawn. (The calculation of these again involves using the nominal boiler efficiency figures.)

The lowest pair of curves shows the quantitative advantage obtained by the application of the lagging in each case. It must be realized that for different lagging materials or dif-

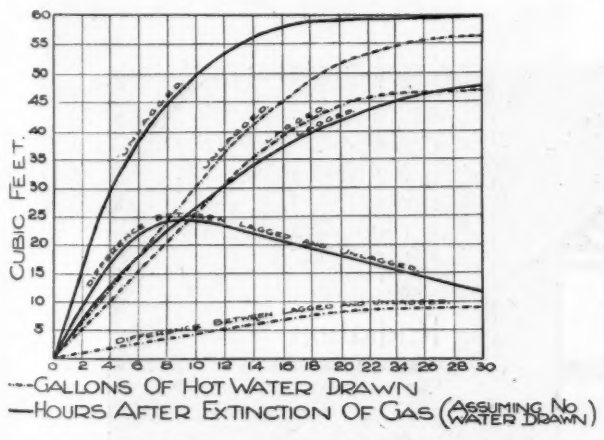


Fig. 7.—Amount of Gas (C.V. 500) Required at 60 C.Ft. per Hour to Re-establish Maximum Water Temperature after Cooling and Drawing-Off Water (Set A). Lagging 1 in. Cellular Asbestos.

ferent installations separate sets of curves are required, but interpolation from fewer experimental results becomes possible. Analysis of such results has afforded an excellent check upon the method adopted, and has confirmed the hope that the influence of variable factors has been considerably diminished. The labour involved in the somewhat tedious process may therefore be considered to have justified itself. It is possible now to proceed to apply these results to particular cases of domestic hot water usage.

For Set A using the nominal boiler efficiencies of 80 p.ct. and 72 p.ct. in the lagged (cellular asbestos) and unlagged condition, and the curves in fig. 3, fig. 5, and fig. 7, the following may be derived:

(1) To heat up from cold to 22,000 B.Th.U. content, lagged requires 55 c.ft. and unlagged 61 c.ft. at gas rate 60 c.ft. per hour—a saving of 6 c.ft. (10 p.ct.) of gas.

(2) To maintain set at 22,000 B.Th.U. content, lagged requires 2·8 c.ft., unlagged 8·8 c.ft. of gas per hour—a saving of 6 c.ft. (68 p.ct.).

(3) Assuming the following routine of usage, gas being continuously alight, the following comparison between lagged and unlagged sets may be drawn:

—	Hot Water Drawn. Gallons.	C.Ft. of Gas Used.	
		Lagged.	Unlagged.
7.0 a.m. — 7.30 a.m. .	15	37	42½
7.30 ,, — 11.30 ,, .	To maintain	11	35
11.30 ,, — 11.35 ,, .	3	7½	9½
11.35 ,, — 2.35 p.m. .	To maintain	8½	26½
2.35 p.m. — 2.50 ,, .	5	14	16
2.50 ,, — 8.50 ,, .	To maintain	15	53
8.50 ,, — 9.10 ,, .	5	14	16
9.10 ,, — 10.40 ,, .	To maintain	4	13
10.40 ,, — 11.30 ,, .	20	44	52
11.30 ,, — 7.0 a.m. .	To maintain	21	66
		176	329½

A saving of 153½ c.ft. (47 p.ct.) in favour of the lagged set (of which 134 c.ft. represents stand-by periods).

(4) As example (3), but assuming gas is turned off at night at 10.40 p.m. and lighted at about 6.15 a.m.
Assuming, as in fig. 7, that the drawing of 20 gallons corresponds in effect upon the heat content of water to 22½ hours' cooling and 11 hours' cooling with lagged and unlagged sets respectively, after 8 hours' subsequent cooling period 48 c.ft. and 60 c.ft. of gas respectively will be required to restore the maximum water temperature. Total gas used in 24 hours, lagged 159 c.ft., unlagged 270½ c.ft., showing a saving of 111½ c.ft. (or 41 p.ct.).

(5) As example (3), but assuming gas is turned off except immediately prior to hot water demand, and that a cut-out valve is in use for small water demands. (Curve figures corrected to ⅕ scale where appropriate.)

Time.	Hot Water Drawn. Galls.	C.Ft. of Gas Used.	
		Lagged.	Unlagged.
6.30 a.m.	15	54	61
11.30 ,, ...	3	9	10
2.30 p.m.	5	8	9½
8.30 ,, ...	5	11	12
10.30 ,, ...	20	54	61
		136	153½

A saving of 17½ c.ft. (11 p.ct.) in favour of the lagged set. It is noted that comparing unlagged set run with utmost economy with lagged set run with gas alight continuously, the consumption is in favour of the former to the extent of 22½ c.ft. (13 p.ct.).

(6) As No. 4, but extra 20 gallons drawn at 6.0 p.m. An extra 44 c.ft. and 52 c.ft. is required on the lagged and unlagged sets respectively, but ¾ hr. maintenance rate is saved on each. Total gas used in 24 hours: Lagged 201 c.ft., unlagged 317½ c.ft., showing a saving of 116½ c.ft. (or 37 p.ct.).

NOTE.—The over-all efficiency figures for the sets in the lagged and unlagged conditions show a great contrast—viz.:

—	Lagged.	Unlagged.
Example 3	49 p.ct.	25 p.ct.
Example 5	55½ p.ct.	46 p.ct.

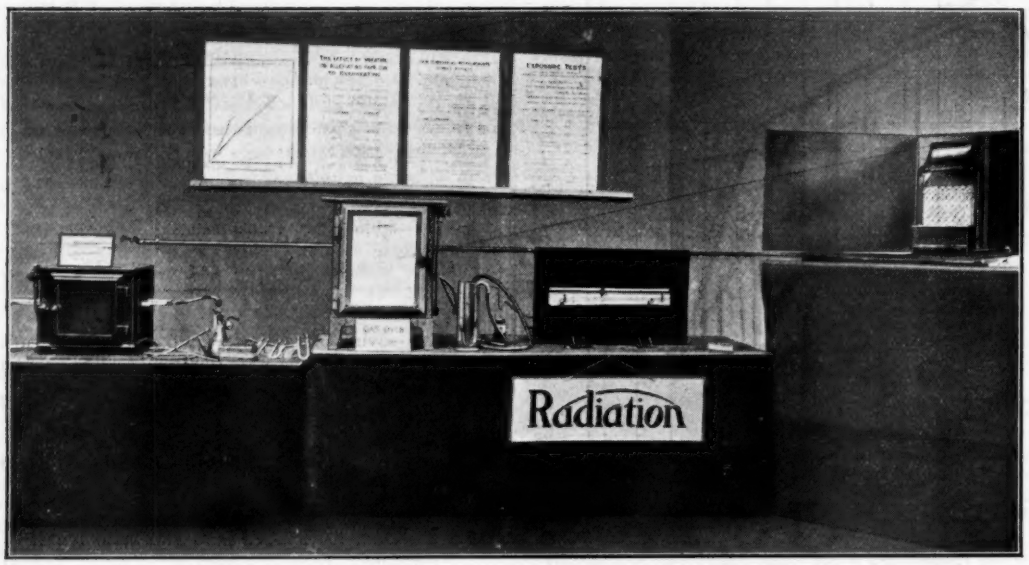
It will usually be found that the mean temperature of the water drawn from the lagged set is higher than that from the unlagged set for a programme involving the same volumes of water.

(To be concluded.)

BIRMINGHAM AND MIDLAND INSTITUTE CONVERSAZIONE.

At this Conversazione, which was held at the Midland Institute, Birmingham, on Jan. 8 to 11 inclusive, from 7 p.m. to 11 p.m. each evening, one section was concerned with the scientific aspects of gas appliances. This exhibit was prepared by Messrs. Radiation, Ltd., by arrangement with the Birmingham Gas Department, and occupied one room of the Institute.

A portion of the exhibit illustrated some of the work carried out at the Central Research Laboratories of Radiation, Ltd., in London, where qualified research workers are continuously engaged in improving the standard of all types of gas appliances, and in trying out new ideas. Much has been done in recent years to increase the thermal efficiency and utility of gas burning appliances, features which are recognized and appreciated by the gas consuming public. Another feature which is not always apparent, or understood, is the considerable improvement which has been made in the hygienic standard of modern gas appliances.

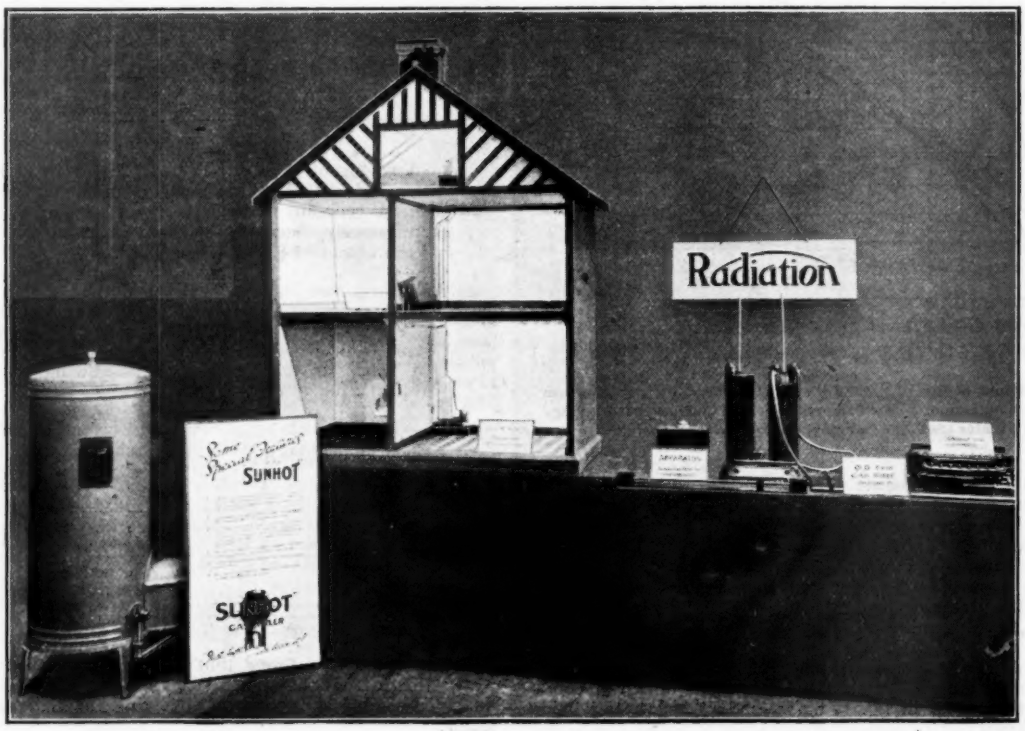


DEMONSTRATION OF THERMOSTATIC CONTROL.

An unsatisfactory hygienic standard is characterized by the presence of carbon monoxide in the combustion products; and as this toxic gas is usually only present in minute quantities, the necessity for its elimination has not always been fully recognized. This, no doubt, has been due, in part, to the difficulty of detecting and estimating the small quantities involved; but apparatus has now been perfected which enables carbon monoxide to be estimated with accuracy to within two to three parts in a million parts of air. An example of this apparatus was on view, and represented in detail the original research apparatus perfected in the Radiation Central Laboratories. The details of the work done on the subject are published in the Journal of the Society of Chemical Industry, Vol. 45, No. 23, June 4, 1926, and Vol. 46, No. 22, June 3, 1927. Also "JOURNAL," Vol. 174, p. 530.

THE "BEAM" RADIANT.

During the last few years, development work by Radiation,



SCIENTIFIC EXHIBIT OF LOW-CONSUMPTION GAS BOILER.

Ltd., in connection with the gas fire has followed an entirely new line, in that methods of improving the quality of the heat emitted have been investigated, and these investigations are still being pursued with success. The first results of this work were made available to the public in November last in the form "of a new radiant, called the "Thermo-XX Beam"—see "JOURNAL" for Nov. 28, p. 600.

All new Radiation standard fires are provided with these new radiants; and as the radiant will fit all existing Radiation standard fires, its advantages are available at once to anyone possessing such a fire. The adoption of the "Thermo-XX Beam" radiant results in the following definite advantages, without any sacrifice of heating power, thermal efficiency, or interchangeability:

(1) A "softer" heat with a sensation of greater comfort is attained.

(2) A brighter fire, more attractive in appearance, results.

(3) The fire heats up more rapidly.

When compared with ordinary clay radiants, the "Beam" radiant is found to emit a greater proportion of visible and short infra-red energy, and it is probably a consequence of this fact that a greater sensation of comfort is attained with it.

Fires were shown alight fitted with "Beam" radiants, and by the aid of a number of charts the action of heat on the human body was explained. The results of tests carried out on a number of persons of both sexes were also given, indicating the improvement in comfort attained with the new radiants.

The great improvements made in the design of gas fire burners were shown by the exhibit of old type and new type burners; and the important developments in the design of gas cookers were demonstrated by means of a "New World" cooker.

The "Regulo" is capable of correctly adjusting the gas supply to the smallest temperature change, and exhibits were on view illustrating the sensitiveness of this instrument. An arrangement was shown which, upon the slightest application of heat to the working parts—even touching with the hand—caused the closing of an electric circuit which started a bell ringing. A further arrangement was shown which embodied a slope gauge in conjunction with a "Regulo" attached to a "New World" oven. The automatic adjustment of the flow of gas by the "Regulo" consequent upon opening and closing of the oven door was indicated on the gauge.

The use of gas for water heating in the ordinary household has been much extended by the recent introduction of a new water heater—the "Sunhot" boiler—in which the maximum gas consumption is about 10 c.ft. per hour. A section of a model house fitted with a miniature glass model "Sunhot" installation was on view, and the stratification of the hot and cold water in the system was demonstrated effectively.

The large number of visitors to this exhibit each evening, and the keen interest shown in the demonstrations were indicative of the increasing public attention given to the developments in domestic gas appliances.

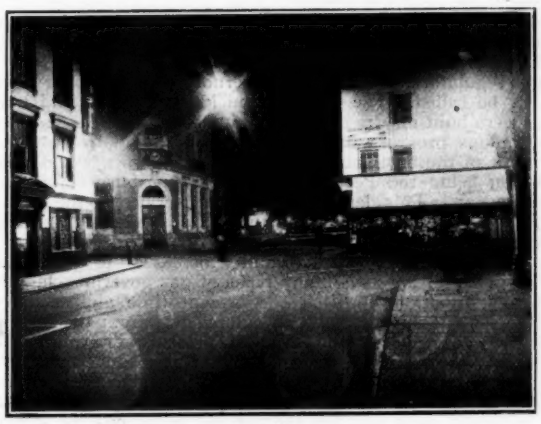
THE LIGHTING OF CROSS ROADS.

The accompanying photographs, taken at night and untouched, show two excellent gas-lighting installations at busy road crossings. One is of Gallows Corner, on the new London-Southend main road—a typical example of a position where ample illumination is necessary. The fine lighting is provided by eight Sugg 15-light "Rochester" suspension lamps, carried by two four-way fitments on steel tube columns 25 ft. high to mantle level. Thus each column gives an illumination of 6000 c.p. The columns are finely proportioned to carry the four-way fitments; and the Romford Gas Company are to be congratulated on an artistic and efficient installation.

The other photograph shows the lighting at Golden Lion Corner, Romford, which again is provided by "Rochester" lamps; one of 1500 c.p. being carried over the roadway by central suspension gear, and others, of 1200 c.p., being used at the corners. This also is an excellent example of cross-road lighting. All the lamps referred to have clock controllers.

It will be observed that both the "A.A." man at Gallows Corner and the policeman at Golden Lion Corner moved while the photographs were being taken.

Gallows Corner.



Golden Lion Corner.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Annual Dinner and Concert.

The Sixteenth Dinner and Concert of the Association, staged at the Holborn Restaurant on Friday, Feb. 1, under the Presidency of Mr. W. TREVOR KENSHOLE, of the Lea Bridge District Gas Company, were in more than one respect a great success. In the first place, the gathering was honoured by the President of the Institution of Gas Engineers, Mr. John Terrace, who proposed the chief toast of the evening; secondly, the presence of many seniors—including Messrs. W. J. Sandeman, H. C. Smith, F. M. Birks, O.B.E., and Walter Grogono—was indicative of the spirit of help and comradeship prevailing between senior and junior members of the gas profession; thirdly, ladies added grace and charm to the event; and finally—perhaps not least important—speeches were few.

After the Loyal Toast had been honoured,

Mr. TERRACE rose to submit "The Association and the President." It was, he said, a great privilege to propose this toast, for he felt that he knew something of the work of the Junior Associations. His close interest with the London Juniors extended throughout many years; and the present function was the tenth consecutive dinner of the Association which he had attended. In addition to the personal note, he was very glad to be present in the capacity of President of the Institution of Gas Engineers. He said this in no boastful spirit, but because he felt that the Institution should show its appreciation of the Junior Associations; and he could assure them that the Institution looked with great favour on this and other Junior Associations. During the past few years the parent body had been active in encouraging co-ordination of all scientific bodies, with a view to helping the profession which they all had so much at heart. With this object, arrangements had been made for closer co-operation with the various District and Junior Associations. The latter, of course, had taken a prominent part in the Education Scheme; and he hoped that the bond which they together had welded would become stronger and stronger with the passage of time. In these days, when one was so excellently served by the Technical Press, affairs in the industry were set out for perusal by all concerned; but he was able to tell them of a new endeavour which he hoped they would appreciate, and of which he trusted they would take advan-

tage. The time of the Institution was so largely taken up by other matters that it had become impossible to devote much of it to the reading of papers. At the same time the Institution, having power to present a goodly number of medals, had considered how they could spread these favours more widely. At a recent meeting of the Council, it had been decided to allocate some of these awards to the District Associations, and one to the Junior Associations, for the best paper read at one of their meetings. This, he hoped, would encourage the members to strive hard to attain the proffered distinction. Personally—as they were probably aware—he had great admiration of the contributions which were made to the proceedings of the Junior Associations; and, as he had mentioned on previous occasions, his references to the "Transactions" of the Juniors were almost as frequent as his references to the "Transactions" of the Seniors. On behalf of the Institution, continued Mr. Terrace, he wished the London and Southern District Junior Gas Association every success in the future. He coupled with the toast the name of Mr. Kenshole, their President. He had known Mr. Kenshole for many years, and he was pleased to find that not only had he made good in the gas profession, but that he had been willing to devote much of his time to the Association. He had known Mr. Kenshole's father longer than he had known their President; and he was saying a great deal in observing that he was the worthy son of a worthy father.

The PRESIDENT, replying to the toast, first of all apologized for the absence of his father, Mr. J. E. Kenshole, Engineer and Manager of the Merthyr Tydfil Gas Company, and of Mr. F. W. Cross, the General Manager of the Lea Bridge District Gas Company. The latter gentleman, he said, extended to the Association an invitation to visit the Lea Bridge Gas-Works on April 13. They had all listened with great satisfaction and pride to the observations of Mr. Terrace, who was one of the firmest friends and staunchest supporters of their Association. They appreciated the honour of his presence in the capacity of President of the Institution of Gas Engineers; and they appreciated in equal degree his presence as a friend. Mr. Kenshole went on to say that reference must be made to their esteemed Hon. Secretary, Mr. Arthur Tennant, who had done so much to uphold the dignity of the Association, and who had worked with such assiduity, enthusiasm, and enterprise for its progress. [Applause.] They were also under a debt of gratitude to the Technical Press, and also to the encouragement they received at the hands of the seniors of the profession. Concluding his remarks with a personal note, he felt it fitting to refer particularly to the manner in which his Chief, Mr. D. Cleave Cross, had afforded him every facility to attend to the work of the Association.

Mr. D. CLEAVE CROSS (Engineer of the Lea Bridge District Gas Company, and a Past-President of the Association), proposing the toast of "The Visitors," said that Mr. Kenshole richly deserved the honour conferred upon him by the Association in electing him President. The Association were exceedingly glad to welcome their guests; and he would like to mention particularly Mr. Terrace; Mr. Dean, who would reply to the toast; the three gentlemen to whose works the Association had had such enjoyable visits during the year—Mr. W. J. Sandeman, of Croydon; Mr. H. Gage, of Sutton; and Mr. H. C. Smith, of Tottenham—Mr. F. M. Birks, of Beckton; and Mr. Stuart Kerr, Principal of the Westminster Technical Institute.

Mr. W. E. DEAN (Engineer, Manager, and Secretary of the Exmouth Gas Company, and President of the Southern Association of Gas Engineers and Managers), replying on behalf of the visitors, mentioned that he was one of the founder-members of the London and Southern District Junior Gas Association. He had been glad to join the members in their recent visit to his old works—Tottenham—and he was extremely glad to be with them again on the present occasion. Having referred to the sterling work of Mr. Walter Grafton and Mr. P. F. Scarth for the Association during its early years, Mr. Dean observed that he was Senior Vice-President in 1906, but his departure from the area at that time prevented his occupying the Presidential chair. The Association, though it had a membership of nearly 350, could claim to be neither the oldest nor the largest of the Junior Associations; but it could claim to be most active. This was very encouraging, for he was still a junior at heart. It was encouraging also to learn from Mr. Terrace that the Institution of Gas Engineers had thought fit to set aside a medal for the Junior Associations. This typified the general attitude of the senior bodies towards the junior organizations.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

On Saturday, Jan. 26, the Western District of the Scottish Junior Gas Association visited the Tay Works of Messrs. Peebles & Co., Ltd., Bonnington. The following is a short account of the firm's activities.

It is now nearly three-quarters of a century since this firm was established in Edinburgh by the late Mr. D. Bruce Peebles, for the manufacture of gas meters—of both wet and dry types—and gas regulators, or automatic governors as they should more properly be called. The business quickly developed, and new works were built on the present site in 1876.

Continuous progress has been made in the many patented inventions of the firm; one of the earliest to gain a world-wide reputation being the Peebles needle governor burner for flat-flame lighting. This device was of great service to the public when gas had to be consumed at the lowest pressure and without a smoky flame.

As pressures of supply gradually increased—to meet the growing demand for gas—many types of gas governor claimed the firm's attention, until at the present time almost every condition of gas supply has been catered for, from the largest gas-works governor to the smallest pressure or volumetric control—down even to a by-pass. By-pass governors are largely used for street lighting and domestic supply. It will be readily realized that to supply governors of every type, in all their different sizes and for the varying conditions for which they are required, necessitates a mass of detail both in designs and parts. Yet Messrs. Peebles are able to meet all demands.

Their later manufactures include dry gas meters of five types—namely, ordinary meters, standard meters, a special small-cased meter, high-capacity meters, and coin-freed, or prepayment, meters. The tinplate dry gas meter has been known in its present form for so many years that improvements would hardly be thought possible. Messrs. Peebles & Co. have, however, made considerable improvements in three important items—viz., the diaphragm, the prepayment attachment, and the stuffing boxes.

Their new diaphragm is of the telescopic type, which gives a very large travel; but its chief characteristic is the method of fixing the leather to the rim. This is done by means of a strong endless spiral spring holding the leather firmly and equally in a groove formed in the usual rim, which is soldered to the division. Tests show that this method of fixing is quite secure and gas-tight; the spring taking up all irregularities in the thickness of the leather without the risk of cutting it.

The coin freed attachment used for prepayment meters is simple and highly efficient. It is of the front change-plate type, alterable to supply a different quantity for the coin used. The whole of the prepayment mechanism and the valve is outside the meter, the driving shaft passing through a small stuffing box, and consequently the meter is always gas-tight.

The patent stuffing box covers a weakness. If the stuffing is packed tightly it puts too great a drag on the meter, with consequent loss of pressure. On the other hand, if it is too lightly packed, leakage is soon likely to appear. By the use of fine cork Messrs. Peebles' stuffing box overcomes these difficulties, as it can be fitted to a certain degree of tightness at the beginning, experience having proved that wear is negligible. Consequently, a minimum of friction is put upon the meter, while the boxes remain gas-tight under heavy pressures. A graphite lubricant ensures smooth action without noise.

Meters are thoroughly tested at all consumptions before being passed to the Government Official Stamper for sealing.

Valves and seats are cast from a special alloy of virgin tin, with pure antimony to harden it. They are ground to a dead flat finish, after the meter is constructed. The diaphragms are made from Persian sheep skins, carefully selected, and half chrome tanned, being treated with a special dressing to keep them tight and flexible.

Besides the ordinary station, district, and retort house governors, Messrs. Peebles have given considerable attention to pressure loading instead of the use of weights or water. The original patent for pressure loading was granted to the late Mr. D. Bruce Peebles in 1875, and is still being used to-day. For many years the firm's well-known underground district governors have been adapted for gas or air pressure loading; the latter from a small air bell in any convenient office or room, or placed in a pillar box at the side of the pavement, any distance from the governor.

Interesting new station governors are those for self loading; the governor automatically altering the pressure according to the demand for gas.

The mercurial district governors are manufactured in all sizes up to 36 in. diameter of connections, and have been built for pressures up to 10 lbs. per sq. in. on the inlet, reducing at one step to low outlet pressures of a few inches water gauge.

The ordinary retort house governor is also made in all sizes up to 36 in. diameter of connections, but a new governor especially devised for this duty—though also capable of being used for other kinds of governing—is the "B.V.R." (Butterfly Valve Relay) governor, which acts on the relay principle. This governor comprises a butterfly valve or valves, actuated by a small piston. The actuating force is air or gas under a pressure of 5 to 10 lbs. per sq. in., which is sent to either end of the piston, as required, to open or close the valve. The determining device is a small delicate diaphragm acted on by pressure or vacuum. The high-pressure air finds an exit to one or other of two small nipples controlled by a small valve interposed between them. This valve is moved by the diaphragm. The closing of one nipple causes the pressure to be retained on the side of the piston to which that nipple is connected, thus moving the valve in one direction; the other nipple allowing the air at the other side of the piston to escape, and *vice versa*.

Apart from the larger works and mains governors, there are also manufactured all classes of consumers' governors for high and low pressures, besides those for gas fires, cookers, refrigerators, and individual lights. Street lamp governors are another important manufacture.

SCOTTISH JUNIOR GAS ASSOCIATION.

Joint Meeting of the Eastern and Western Districts.

A Joint Meeting of the Eastern and Western Districts was held on Dec. 12 in the Royal Technical College, Glasgow; Mr. JOHN MURRAY (Glasgow) presiding over a large attendance of members.

The CHAIRMAN extended a very hearty welcome to the Eastern Members who were present.

TAR.

By C. CHAPMAN, F.I.C., A.M.I.Chem.E., Manager, Provan Chemical Works, Glasgow.

There is no standard tar. The best known is the tar produced from high-temperature treatment of a good coking coal, which contains an average percentage of oxygen and sulphur. The tar so obtained is familiar to those concerned in tar handling, and the various fractions obtained in distillation have definite uses, and are standard articles of commerce. Should any one of the above conditions be altered, the resulting tar will differ considerably from the original.

The influence of the temperature is probably the greatest of all. It is, of course, difficult to specify the exact, or even the average temperature of any carbonizing process, but results obtained on a semi-works scale, in which the temperature could be maintained within narrow limits, showed that the maximum production of tar occurred at a carbonizing temperature of 550° C. This is a peak point, and thereafter the yield falls rapidly, while the production of gas rises. The figures refer, of course, to one class of retort—horizontal. The quality of tar obtained at 550° C. is very different from that (say) at 800° C. It is unusual to carbonize a poor coking coal, but the usual effect is a reduction in quantity of tar, as might be expected. The effect of differing amounts of oxygen and sulphur is of especial interest to Scottish technologists. The available tar acids in the tar increase with the amount of oxygen, and, as tar acids are normally of value to the distiller, the high oxygen of Scottish coal implies that the tar therefrom is of greater value than the tar from other sources.

Sulphur in the coal results in the production of H_2S, and it is found that the hydrogen necessary for the formation of this product is derived from hydrocarbons containing high proportions of hydrogen, the result being to leave in the tar the substances classed as "free carbon." These are not really carbon, but compounds containing a high percentage of this element. The importance of this will be discussed later. For the moment suffice it to say that users of tar prefer a reasonably high "free carbon" content.

It is perhaps a safe assumption that all here are primarily concerned with the tar from Scottish coal, so that it may be taken for granted that there will be a high tar-acid content and a low free-carbon content, whatever the method of carbonizing. Let us, then, briefly discuss the effect of the various systems of carbonizing.

Apart from the straightforward effect of temperature, there is an important factor to be considered in the amount of heated surface that the tar-vapours encounter during evolution. Horizontal retorts have relatively large surfaces at high temperatures, and these decompose the tar. Thus it is characteristic of horizontal retort tars that they contain relatively higher amounts of the above-mentioned "free carbon," naphthalene, and anthracene, no paraffins, and only small quantities of the higher-boiling tar acids. These remarks apply also to coke oven tar. Lower temperatures of carbonizing and less exposure to heated surfaces, in free spaces, are met with in other systems. The order of temperature is as follows: Ultra-narrow coke ovens, ordinary coke ovens, horizontal retorts, inclined retorts, vertical retorts, and low-temperature carbonization processes—such as the Maclaurin process and the Turner process, to mention two locally developed systems. This order is a general classification, but there are exceptions, of course. The temperature varies from 1300° C. (high) to 400-500° C. (low). The resultant tars show gradation in every property, chemical and physical, and in yields of the tar and of the various components of the tar.

Effect on the Tar of Various Methods of Carbonization.

Process.	Average Temperature. °C.	Yield of Tar. Galls. per Ton.	Sp. Gr. of Tar.	Free Carbon. P.Ct.	Pitch. P.Ct. Wt.
Narrow coke ovens. .	1300	..	1·210	22·0	72
Ordinary ovens . . .	1000–1250	9·5	1·200	14·0	60
Horizontal retorts . .	900–1200	11·0	1·190	15·0	66
Inclined ,, . .	1000–1100	12·0	1·155	6·0	58
Vertical ,, . . .	1000–1200	15·5	1·080	2·5	48
Low-temperature carbonization	600–700	18·3	1·035	1·0	40

Percentage of Naphthalene and Paraffin in the Distillate to 360° C. from Various Tars.

—	Naphthalene. P.Ct.	Paraffin. P.Ct.
Narrow coke ovens.	30–35	*Nil*
Ordinary coke ovens	20–30	*Nil*
Horizontal retorts	15–20	Trace
Vertical ,, ...	under 5	13
Low-temperature carbonization . . .	*Nil*	25–50

Lanarkshire Coal Carbonized by the Glasgow Corporation Gas Department.

Station	Dalmarnock.	Provan (New).	Provan (Old).	Tradeston.
Type of Retort . . .	Maclaurin Low-Temperature.	Vertical.	Horizontal.	Horizontal (High Heats).
Yield of tar (galls. per ton)	16·5	14·8	11·0	10·8
Sp. gr. of tar . . .	1·050	1·075	1·180	1·212
Crude naphtha (galls. per ton)	25·2 (Sp. gr. 940)	20·3 (922)	6·0 (928)	13·7
Light oil	47·9 (Sp. gr. 973)	30·0 (983)	20·0 (1000)	19·0
Middle oil	26·6 (Sp. gr. 1000)	27·7 (1013)	20·0 (1026)	11·7
Heavy oil	4·4 (Sp. gr. 1013)	35·0 (1034)	20·0 (1048)	1·6
Pitch (cwt.) . . .	10·4	9·7	13·66	14·57

Analysis of Glasgow Corporation Tars.

(Yields in Gallons per Ton.)

Products.	Maclaurin Low-Temperature.	Provan Vertical.	Provan Horizontal.	Tradeston Horizontal.
Motor spirit . . .	0·05 (Sp. gr. 854)	0·30 (858)	1·60 (875)	0·04
Light solvent . . .	0·56 (Sp. gr. 820)	0·28 (844)	1·12	0·25
90/160 ,, . . .	0·66	0·97	2·66	0·16
90/190 ,, . . .	1·77	2·23	3·37	0·37
	— 3·04	— 3·78	— 8·75	— 0·82
Unsaturated comps. .	1·27	2·10	..	2·73
Pyridine bases . .	1·79	3·91	1·60	2·73
Crude tar acids . .	41·0	18·72	10·56	6·95
Crude naphthalene .	*Nil*	*Nil*	112 lbs.	130 lbs.
Crude anthracene .	*Nil*	*Nil*	3 lbs.	5 lbs.
Creosote	56·0	77·4	34·3	20·9
Pitch	10·4 cwt.	9·72 cwt.	13·66 cwt.	14·57 cwt.

Distillation Tests of the Tar Acids from the same Tars.

Temperature. °C.	Maclaurin.	Provan Vertical.	Horizontal.
190	..	..	..
195	..	..	4
200	3·5	4	31
205	11·0	21	56
210	24·0	38	71
215	36·5	50	79
220	50	57	84
230	65	70	90
240	75	75	94
250	80	80	..
260	85	83	..
270	90	87	..
280	92	90	..
290	94	94	..
300	..	..	..

BLENDING AT CENTRAL DISTILLERIES.

Whatever the method of production, the tar acid content, pitch yield, and quality differ from the same items when any coal other than Scottish coal is used. Thus the tar produced in (say) the Midlands is different from our Scottish tar under the same method of production. Unfortunately, the tar acid content of road tar is a serious item, according to the Road Board Authorities; and while it is profitable to extract the tar acids when handling tar on a large scale, it is not so feasible a proposition when the production of one works only is handled. It is very doubtful if it would be profitable for a works, or combination of works, less in size than Glasgow or Edinburgh to undertake the extraction of tar acids; yet, at the same time, there are very few instances in which the refined tar sent out by producers who do not extract the tar acids will comply with the specifications laid down for road tar.

Again, it must be remembered that tar for roads is faced with severe competition from bitumen, which is produced in

bulk under skilled supervision, the quality being very uniform. When each tar-producer distils his own tar, there is naturally considerable variation in quality, or at any rate in test. This leads to internecine competition, which is not good for the gas industry as a whole, and the smaller works in particular. With these points in mind, it is easy to see that there are undoubted advantages in blending the various tars at some central distillery under any sales or co-operative schemes that may be found satisfactory. Co-operative schemes are popular in England at present, and seem to be the most just to the small producer.

ROAD TAR SPECIFICATIONS.

The competition from bitumen, among other considerations, has led to the formation of the British Road Tar Association. The aim of this Association is to popularize the use of British Tars for British Roads; and as the chief outlet for the tar from small producers is for road dressings, the operations of this body are of paramount importance. The Association is maintained by contributions from members according to their production. Small producers are eligible; and even if they do not join, it seems only just that they should do all in their power not to hinder the operations of the Association. It will be realized that all producers will benefit from the campaigns instituted, so that the tenets of the Association should be upheld by all concerned with tar, whether members or not.

With this in mind, let us examine their latest specifications to determine the reasons which have led to the various clauses.

The specifications are as follow:

—	No. 1.	No. 2.
	P.Ct.	P.Ct.
Content of C.W.G. tar	0 –10	0 –10
Sp. gr. at 15° C.	1140–1225 (Sc. V. R. 1110)	1150–1240 (Sc. V. R. 1120)
Phenols in tar	0 – 5	0 – 4
Water	0 – 0·5	0 – 0·5
Crude naphtha or light oil (200° C.)	0 – 1·0	0 – 1·0
Middle oil (200–270° C.)	9·5–21·0	8 –16·0
Heavy oil	3·5–12·0	3·5–12·0
Total distillate	Not now	specified
Naphthalene	0 – 6	0 – 5
Free carbon	0 –20	6 –21
Consistency B.R.T. viscometer at 30° C.	10–40 secs.	40–125 secs.

C.W.G. Tar.—This tar is inferior in binding properties, but as there is almost inevitably some carburetted water gas tar to dispose of, the quantities specified are allowed; these amounts not affecting the quality of the mixture to any extent.

Sp. Gr.—The lower limits exclude tars other than genuine coal tar. Wood tar, bone tar, and low-temperature tars are excluded. The upper limits exclude beehive coke oven tar and similar tars, which have been decomposed or "cracked" excessively.

Phenols in the Tar.—The limits laid down are supposed to ensure that the toxic action to anything living which comes into contact with the drainage from the roads is not affected. The chief result from the roadmakers' viewpoint is that the water-soluble portion of the tar is kept low, and there is, therefore, less chance of deterioration of the surface under the influence of rain.

Water.—The tar before use must be heated in road-side boilers, and if the water content is below 0·5 p.ct., there is small chance of danger through frothing. This is a very important clause.

Light Oil.—Any excess of this oil would make the heating of the tar a dangerous operation. The oil is the most volatile portion, and tends to leave the tar before it has done its work.

Middle Oil.—This portion evaporates during the setting to some extent, hence there must be some present. Excess would cause undue fluidity and undue loss. It contains the tar acids which are determined, and therefore should be kept as low as possible. The naphthalene is also present in this fraction.

Heavy Oil.—This portion is not readily volatile. It remains in the tar film, giving it plasticity. It is therefore desirable, but excess would cause greasiness of the surface.

The Total Oil Distillate used to be specified, but it was manifestly impossible to control all the points, and had, perforce, to be discarded.

Naphthalene.—Is the most volatile constituent. It produces a greasy surface, and is toxic in its action. Excess affects the consistency, and, from every standpoint, naphthalene is undesirable. The difficulty of removing this substance has prevented a more drastic limit, the opposition from English producers being massed against a lower limit.

Free Carbon is a bone of contention among road specialists and tar distillers. It is difficult to see what part such an inert substance can play. The bituminous portion of the tar is presumably the binding part, and it is defined as that portion other than free carbon. Certain tars contain high percentages and are good road tars; hence the wide range 0-20 p.ct. On the other hand, Scottish vertical retort tars contain practically none, and are none the less efficient; hence the lower limit. If, however, the tar has been cracked, or "stewed," the free carbon is augmented at the expense of the binding elements, and the tar becomes partially coked or "burnt," and has only a meagre binding propensity. This accounts for the upper limit, which bears hardly upon some producers.

Consistency.—The recommendations are such as common sense would suggest for the work to be undertaken, and the limits are unexceptionable. The chief point to notice is that there is specified a new viscometer. The new form is one which demands a less quantity than the older form—Hutchinson's viscometer. The test consists of timing the flow of 50 c.c. of tar through an orifice. It has met with some criticism recently, so the time is inopportune to discuss it further.

It will be seen that it is a difficult matter to cater for all classes of tar in the permissible limits, and at the same time to preclude inferior tars. One feature of the above general specification was particularly objectionable to Scottish producers—namely, the specific gravity clause. With the best intentions it was impossible to comply with the requirements when the crude tar was derived from vertical retorts. Fortunately the interests of Scottish producers were in the charge of capable tacticians, and, led by Mr. James Macleod, they succeded in having inserted the special saving clause that lower limits were allowable in the case of Scottish vertical retort tar.

Discussion.

Mr. R. J. GAVIN (Kirkcaldy), thanking Mr. Chapman for his very interesting paper, asked the relative costs of the "T.I.C.," Wilton, and Wikner plants, for a tar production of 200,000 gallons per annum.

Mr. CHAPMAN replied that the size of the plant was determined by the length of the tar season. The year's make might be stored and released within a period of three months. Thus the policy of the undertaking would determine the actual size of plant. It was also necessary to consider running costs as well as capital costs. For instance, the "T.I.C." plant had high capital cost for lead, but this lead did not depreciate in value to any extent. The Wilton coils were cheap, but it was a laborious task to replace a broken lap. The Wikner dehydrator required the least repairs and renewals, and was the cheapest, everything considered, for tar dehydration.

Mr. R. FIFE (Kilmarnock) spoke of the fear of the layman of tar. He said they had heard it was not possible to produce a No. 1 tar with the Wilton plant dehydrating coils. He asked if a combination of coil and pot still would not give the required results.

Mr. CHAPMAN stated that such a combination was available at the Glasgow Corporation's Works at Dalmarnock. Straight stripping was almost certain to leave in excess tar acids or excess naphthalene. In Scotland it was fortunate that the naphthalene was very low, but the tar acids were often in excess of the permitted amounts, though this was of less importance than a naphthalene excess. With English tars the position was reversed. To be absolutely certain of producing a satisfactory refined tar, the oil was partly removed and replaced by washed and drained oil.

Mr. J. FRASER (Dalmarnock) thanked Mr. Chapman for his address. He asked if the figures given in the tables were obtained in laboratory or works distillation, more particularly those referring to the Maclaurin plant. He had had some experience of the inward-dished still, as in 1915 he had introduced them in Dalmarnock Works—probably the first in Scotland. He was not convinced that this type was better, or that any benefit was derived. He felt that gas pockets might be found in the dish, and prevent proper transmission of heat to the tar. The life of the stills was about 2½ years, wastage being great between the rivets of the shell of the still.

Mr. CHAPMAN replied that the figures quoted were from large-scale laboratory work, care being taken to conform as far as possible to works practice. The Maclaurin tar was not distilled on a works scale, as there was not yet a demand for the products of distillation. It was possible, on the Provan type of inward-dished stills, to observe the dome, and there was no sign of dormant gases. In any case the radiant heat was the most effective form, and this was not affected by gas pockets. He found that 2½ to 3 years (1800 tons) was the normal life of a still, and agreed that 3 p.ct. depreciation was far too low.

Mr. KEILLOR (Greenock) spoke of troubles he had experienced where a swan-neck had given way and caused a fire, and mentioned excessive corrosion due probably to ammonia. Was ammonia recoverable in the dehydrator?

Mr. CHAPMAN, in reply, stated that the ammonia was recovered by solution in the water. There were some uncondensed gases for which provision had to be made. Corrosion was dissociated by the heat. With Kentish coal the chlorides formed a very serious problem.

The CHAIRMAN then moved a vote of thanks to Mr. Chapman for his very able and interesting paper, which the Association were proud to have in their "Transactions."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Tully Gas Plants, Ltd.

SIR,—Relative to the paragraph on Tully Gas Plants, Ltd., appearing in your issue for Jan. 30, as this notice has appeared in other papers, and there seems to have been some slight misunderstanding owing to the somewhat similar names, we shall be obliged if you will mention that we are in no way associated with this Company.

A. V. TULLY,
Director.

Tully, Sons, & Co., Ltd.,
Millgate, Newark-on-Trent.

REGISTER OF PATENTS.

Pneumatic Separation or Grading.—No. 302,400.

WOODALL-DUCKHAM (1920), LTD., and DUCKHAM, A. MC., both of Victoria Street, S.W. 1.

No. 18,183; Oct. 8, 1927.

This invention relates to improvements in the separation or grading of solid materials by the action of an air blast. In one kind of apparatus for this purpose it is the intention that the lighter constituents of the material shall be borne on the blast and float above the heavier constituents, while the support on which the mixture rests is subjected to a reciprocating motion whereby the heavy constituents are moved in a longitudinal direction. In order to avoid pollution of the atmosphere by the lightest constituents of the mixture, which are carried away by the air blast, it is common practice to provide large dust-catching chambers above the separating device.

The invention seeks to improve such dust-catching chambers with a view to ensuring a better disposition of dust therein, so that the air which is returned to the fan to avoid pollution of the atmosphere shall enter the fan as free as may be from suspended matter, thus prolonging the life of the fan.

Burners for Metal Melting.—No. 302,532.

SOUTH METROPOLITAN GAS COMPANY, CHANDLER, D., and COOKE, J. J., all of Old Kent Road, S.E. 15.

No. 10,747; April 11, 1928.

This invention relates to improvements in gas burners, and is particularly applicable to burners employed for heating metal melting pots. Such burners are required to burn a large quantity of gas mixture at low pressure, and are therefore of considerable size; and it is the object of the present invention to provide such a burner which shall be simple, durable, and cheap to manufacture, and which shall readily be accessible for cleaning purposes.

The burner comprises a hollow body portion to which gas mixture is supplied, and a plurality of burner portions in communication with the interior of the body portion, and each detachably connected to it by a spigot and socket joint.

The burner portions comprise trough-shaped members adapted each detachably to receive a fireclay or metal plate formed with outlets through which the mixture can flow.

Tar Distillation.—No. 303,038.

GAS LIGHT AND COKE COMPANY, of Horseferry Road, S.W. 1, ADAM, W. G., of Loughton, and POTTER, F. M., of Leytonstone.

No. 22,542; Aug. 27, 1927.

The principal object of this invention is to provide a method of continuous distillation in an apparatus designed to yield, at the first distillation, fractions of narrow boiling-point range, and to reduce considerably the formation of so-called free carbon in the pitch residue by avoiding cracking as far as possible.

Accordingly the whole of the material to be treated is passed through one or more, but preferably two, heating coils while being maintained under pressure, and is then allowed to expand suddenly; the liquid and vapour being separately withdrawn and separately passed in heat-exchanging relation with the material to be passed to the heating coils. Preferably the expansion vessel connected to any or all of the pressure heating coils is supplemented by a fractionating column for the vapours. Preferably also a reheating still is provided for the condensed liquid so as to obtain a separation of further vapour fractions without subsequent distillation. According to a further feature, the soft pitch passing from the heating coils is subjected to treatment with superheated steam in a tower or column down which it passes in counter-current to the steam so as to give up its more volatile constituents and leave a pitch residue of required melting point.

In a preferred form of the invention, coal tar, after preheating and dehydrating in condensing coils, is passed through two coils in series leaving the first at a temperature of about 225° to 240° C., and leaving the second at a temperature of about 260° to 300° C. After leaving the first coil it is expanded in a chamber which forms the part of a fractionating column and reheating still; this column being operated to give a distillate of high naphtha content and a condensate oil of high naphthalene and phenol content. The residue passes through a second coil and is expanded into a second similar chamber having a fractionating column, and, if necessary, a reheating still designed to give a carbolic oil fraction of high naphthalene and cresylic acid content and a creosote oil fraction. The distillates from the fractionating columns are condensed in coils or other devices which are cooled by coal tar before entering the first coil. The tars are thus preheated and at the same time deprived of water and light oils which are thereby distilled off and are condensed for recovery of the benzene hydrocarbons.

The pitch leaving the second expansion chamber is caused to flow down towers partially or wholly filled with a suitable packing (or, alternatively, fitted with suitable fractionating plates) meeting an ascending current of superheated steam. This removes all or part of the anthracene oil, leaving a pitch of any desired consistency.

Gasholders.—No. 303,045.

NIELSEN, H., LAING, B., and MCCLEARY, J., all of Petty France, S.W. 1

No. 25,424; Sept. 26, 1927.

According to this invention means are provided for storing or circulating in the space above the piston of a tankless holder an inert or relatively inert gas. The inert gas used may be one which is deficient in oxygen—for example, combustion gases, which may be withdrawn from any suitable source of supply. The space above the piston may be partly or entirely enclosed, for example by being provided with a dome or cover. The pipe for conducting the inert gas to the space above the piston may be provided with a non-return valve, and at a suitable point above the piston an outlet valve may be provided. The outlet valve may be provided with a spring adapted to open at a suitable pressure, so that as the piston rises the excess inert gas will escape to the atmosphere. If desired, the non-return valve may be adapted to open at any desired reduced pressure so as automatically to admit a further supply of combustion gases.

Alternatively, the inert gas may be circulated continuously through the space above the gasholder.

Meters.—No. 303,199.

THORP, F., and BUTTERWORTH, E., of Stretford, and THE ROTARY METER CO., LTD., of Kennington Road, S.E. 11.

No. 25,783; Sept. 29, 1927.

This invention relates to gas meters having measuring bells or chambers automatically oscillated about pivotal supports in the oil or other sealing liquid in the case of wet meters, or having automatically oscillating flexible diaphragms in the case of dry meters.

The object of the invention is to provide an improved arrangement of the valve and gas ways; and it comprises a rotary piston-type valve rotating in one direction only and divided into two parts by a diametral partition, one part being closed at one end and communicating with the gas inlet, and the other part closed at the other end and communicating with the gas outlet, the valve periphery having two gaps or ports therein opposite to one another, one in each part of the valve.

An additional feature of the invention is that the barrel and the ported casing may be slightly tapered, and the barrel capable of endwise adjustment to bring its peripheral surface into close proximity to the casing. The barrel is free from actual contact with the ported seats, but is sufficiently close thereto to ensure that the film of gas and oil vapour between the parts will serve as a jointing medium to prevent leakage, while offering a minimum of resistance to the valve movements. If the gas be dry, means for lubricating the peripheral surface of the valve may be provided.

Dry Gasholder Seal.—No. 303,316.

WAGNER, R., of Berlin-Charlottenburgh.

No. 10,991; April 13, 1928.

It is an object of this invention to provide a simple and reliable gas-tight seal or packing between the disc and the wall of a "dry" gasholder, and to this end the packing or seal is made of hard solid fat.

The term "solid" or "hard solid fat" used in the specification and in the claims is intended to define a substance whose consistency is such that it behaves like a solid throughout the range of operating temperatures arising in a gasholder—that is, so that it will propagate pressure exerted upon its surface subtantially in the direction of the pressure. Such solid fats are known to consist of emulsions of various soaps in mineral oils, and are made in very many grades of rigidity, and the patentee points out that a grade suitable for his invention is known in the trade as "roller neck bricks." The hardness of these bricks is so considerable that they may be used in open channels, and their exposed surfaces may be loaded with weights without the latter penetrating into them.

It is another object of the invention to provide suitable channels for supporting such fats in gasholders, and various ways of doing so are fully described, illustrated, and claimed.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 30.]

Nos. 1951—2793.

ALADDIN INDUSTRIES, LTD.—"Incandescent mantles." No. 2041.
BEARD, G. F. H.—"Tankless gasholders." No. 2274.
CARTER, D. H.—"Water gas generators." No. 2565.
CHASE, W. H.—"Geysers." No. 2547.
DODDS, H.—"Gas irons." No. 2727.
DRY GASHOLDERS, LTD.—See Beard, G. F. H. No. 2274.
ELKINGTON, V.—"Detecting gas leakages." No. 2405.
HUFF, W. J.—"Purification of gas." No. 2594.
I. G. FARBENINDUSTRIE AKT.-GES.—"Low-temperature carbonization." No. 2733.
IMBER, J.—See Aladdin Industries, Ltd. No. 2041.
JOHNSON, J. Y.—See I. G. Farbenindustrie Akt.-Ges. No. 2733.
KELLY, W.—"Gas grillers." No. 2696.
KROMSCHRODER, F.—"Gas meters." Nos. 2026, 2510.
LOGAN, L.—See Huff, W. J. No. 2594.
LUSBY, O. W.—See Huff, W. J. No. 2594.
MILBOURNE, R. J.—See Beard, G. F. H. No. 2274.
PEEBLES, A. C. & W. C.—"Waterless gasholders." No. 2127.
PREMIX GAS PLANTS, LTD.—"Ovens, dryers, &c." No. 2523.
TYRER, D.—"Water gas generators." Nos. 2563, 2564, 2565.
WILSON, D. L.—"Prepaid gas meters." No. 2695.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF COMMONS.

Coke-Oven Plants.

Lord H. CAVENDISH-BENTINCK asked the Prime Minister whether the Government would consider what assistance and encouragement it could give towards creating an amalgamation of the coking interests in Durham and Northumberland, in order that the present numbers of coking plants might be largely reduced and inefficient plants replaced.

The PRIME MINISTER said that the National Fuel and Power Committee, in their report issued in September last, recommended that the coke oven owners should in many cases consider plans for reorganizing their coke oven plants into installations serving a number of collieries and equipped with a modern type of oven. This recommendation had been communicated to the National Association of Coke and Bye-Product Plant Owners for such action as they might think expedient. The grouping of coke ovens would no doubt be facilitated by amalgamations; and the provisions of section 55 of the Finance Act, 1927, for giving relief from Capital and Transfer Stamp Duties in cases of reconstruction or amalgamations of companies, would, of course, be of assistance in appropriate cases.

Mr. SHINWELL inquired what the Government would do if the owners took no action.

The PRIME MINISTER said that he thought the owners were extremely likely to take action.

Mr. SHINWELL then asked if it had not been proved that the owners had been lacking in response to these appeals.

The PRIME MINISTER replied that he happened to know that a good many schemes were at present under consideration; and he thought they could be carried out better in that way than by the Government.

Gas Explosions.

Sir HARRY BRITTAIN asked the Minister of Transport whether, in view of the series of gas explosions and burst water mains in London recently, he would cause an inquiry to be instituted as to the effect of modern traffic weights and speed on underground services.

Colonel ASHLEY said he had no information that would lead him to suppose that the occurrences referred to were due to the weight and speed of road traffic, and in any case it was necessary to await the report of the Commission appointed to inquire into the series of explosions in Holborn before considering the question of any further inquiry.

Mr. HORE-BELISHA asked the Minister of Transport whether his Department was looking into the causes of the recent underground explosions in London; and whether any steps were being taken to prevent their recurrence as far as possible.

Sir WILLIAM JOYNSON-HICKS replied that immediately on the occurrence of the explosion of Dec. 20 he consulted the other Government Departments concerned and the London County Council, and with their concurrence appointed a small commission of experts "to inquire into the circumstances of the series of explosions and fires which occurred on Dec. 20 and 21 . . . and to make a report thereon, adding any observations or recommendations which they might think right to make with a view to minimizing risks to life and property in the future." The Commission met on Dec. 22, and had been proceeding actively with its inquiries. It was obviously necessary to wait for its report and recommendations before deciding on future action.

Private Bills.

The Gas Light and Coke Company's Bill was put down for Second Reading on Monday, Feb. 4; but as a rejection notice appeared on the Order Paper in the name of Mr. Ernest Thurtle, the Labour M.P. for Shoreditch, it was adjourned until a later date. On the same day the South Suburban Gas Bill was given a Second Reading unopposed, and was referred to a Committee. The Winchester Water and Gas Bill was also given a Second Reading, and committed.

"VICTOR" GAS BOILERS
AT OLYMPIA

"R" Series "VICTOR" Boiler for Gas-Fired Central Heating Apparatus.

The "IDEAL HOME" EXHIBITION, to be opened on February 26 at OLYMPIA, is again looked forward to with considerable interest this year as the means of bringing to the notice of the Gas Industry, as well as the general public, the advance that has been made in the various branches of the Gas Industry.

"VICTOR" Boilers, and the application thereof to heating and domestic supply problems, will be fully represented on our Stand, No. 95, Ground Floor, Main Hall, as well as in various other parts in Olympia, of which further announcements will be given in due course.

Modern conditions demand stability in construction, combined with general utility and efficiency, in which "VICTOR" Boilers maintain their high position, and where the cost is the all-important factor, or even of secondary importance, hot water systems undertaken by Thomas Potterton (Heating Engineers), Ltd., fulfil all obligations imposed, and justify by dependability in action and moderate outlay any orders placed for them.

Complete Installations undertaken under supervision of competent Engineers

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RAVENSWOOD ROAD, BALHAM, LONDON, S.W. 12

Telephone: STREATHAM 2052/3 Telegrams: "POTTERTON, BAL. LONDON"

MISCELLANEOUS NEWS.

BLOOMSBURY EXPLOSION INQUIRY.

(*Continued from p. 296.*)

Monday, Jan. 28.

The CHAIRMAN announced that Col. Thomas was confined to his home by illness. In those circumstances he asked for the views of Counsel as to the desirability or otherwise of proceeding with the inquiry in accordance with the programme.

The ATTORNEY-GENERAL said that it was convenient to proceed with the inquiry during Monday, but suggested that the Commissioners might care to cancel Tuesday's sitting and continue on Wednesday.

It was decided by the Commissioners not to sit on Tuesday.

A PETROL LIGHTER FOUND.

The ATTORNEY-GENERAL intimated that late on the previous evening he had learned of the discovery of a lighter at a distance of about 15 ft. from the manhole opening on the Post Office tube at which the accident had occurred. The lighter was found on Jan. 10 by a workman. It was of an expensive type, silver plated, made by Messrs. Dunhill, and listed in their catalogue at 25s., so that it was not such as one would expect to find in the possession of Thrower, the Post Office worker who was injured at the time of the explosion, and had since died. It was desirable, he said, that anyone who had lost a lighter of that type should come forward and say so.

It was intimated by Mr. W. CRAIG HENDERSON, K.C. (Counsel for the Charing Cross Electricity Supply Company), that he had succeeded in tracing a man whose evidence the Commissioners had expressed a wish to hear.

This was Mr. *B. Gibb*, an employee of Messrs. Ferguson, Pailin, Ltd., electrical engineers, who was engaged temporarily at the Electricity Supply Company's station near the scene of the explosion on Dec. 20. Three of the employees of the Supply Company, said witness, had recounted to him a conversation with a man near the scene of the accident, in the course of which the man had mentioned that his mate had used a lighter in the manhole. It had been suggested to him by his informants that it would be well not to mention the matter further, for fear that the man who was said to have used a lighter might get into trouble. In consequence, witness had said nothing to anybody about it.

[It was stated at this point that Mr. THOMAS DAWSON, solicitor, had been appointed to represent Mrs. Thrower at the inquiry.]

The evidence previously referred to by the Attorney-General, with reference to the finding of the lighter, was then given.

Mr. *E. F. Parker*, an employee of a firm of contractors to the Post Office, said he had found the lighter on Jan. 10, when engaged in the breaking of concrete near the manhole at which the accident to Thrower (the Post Office worker) had occurred. The lighter was found in a heap of concrete and earth.

Mr. *L. A. White* (a labourer employed by the Post Office, who has been engaged on the work of restoration at or about Holborn since Dec. 22) said he had seen Parker using the lighter, and had asked him how he had obtained it, remarking at the same time that it was very much like one he had seen somebody else use. The person he had in mind was Thrower. He added that he had seen Thrower with a lighter on several occasions, and on one occasion had borrowed it.

Questioned by Mr. DAWSON,

Witness said he was not aware that Mrs. Thrower, in evidence, had stated that, so far as she knew, her husband did not possess a lighter. He was certain that it was Thrower, and not another workman, who had possessed the lighter.

Mr. DAWSON suggested that when witness had spoken to Mr. Parker about the lighter he was not at all sure that it was Thrower who had used it previously.

Witness replied that he was sure.

Questioned by Mr. MILLER,

Witness said he had seen the lighter in Thrower's possession for a period of about two or three months.

Evidence was then called by the G.P.O. representatives with regard to the leakage of coal gas which has been referred to as having been detected on Dec. 16 outside 216, Shaftesbury Avenue.

Mr. *T. W. Baxter*, who is connected with a business at this address, said that on Dec. 16 there was a strong smell of gas around the meter in the basement of No. 216.

Mr. *W. R. Cutts*, a clerk employed at 216, Shaftesbury Avenue, stated, in a written deposition, that late on Saturday afternoon, Dec. 15, he had noticed no smell of coal gas.

Mr. *D. W. Glover*, M.Sc., A.I.C. (Member of the Research Staff of the Post Office Engineering Department), gave evidence with regard to analyses he had made, on July 10 last year, of gas obtained from the Post Office tube near Kingsway, at the point at which it joined the L.C.C. pipe subway. He had made two analyses of the gas, using Prof. Haldane's apparatus. Commenting on the fact that Mr. Hollings had, in his evidence on Jan. 24, expressed doubt as to the correctness of the carbon monoxide determination, and had suggested that what was reported as carbon monoxide might in fact have been acetylene, witness said this doubt might have had some basis if cuprous chloride had been used in analyzing; but inasmuch as Prof. Haldane's method of determination had been employed, he did not think there was the slightest chance of carbon monoxide having been confused with acetylene.

Mr. *C. E. Richards*, A.I.C. (another member of the Research Staff of the Post Office Engineering Department), said he had no doubt as to the accuracy of the analyses referred to by Mr. Glover. He also referred to some analyses of air from ducts near the Post Office tube, which samples were taken on Jan. 19 and 21—*i.e.*, since the explosion occurred—and mentioned that he had noticed a distinct smell of coal gas.

Mr. MILLER, cross-examining, said he gathered that the witness had not communicated with anybody else likely to be interested in the taking of the samples and their analysis, inviting the attendance or co-operation of those interested parties.

Witness agreed.

Mr. *Robert Sinclair* (Chief Inspector of the Centre External Section of the Post Office Engineering Department), who had given evidence in the early stages of the inquiry, was recalled, and gave further evidence as to inspections of the Post Office tube over a considerable period. On occasions he had been accompanied by representatives of the Gas Company, who had always been willing to do what they could in the matter. Since 1926, he said, there had always been a faint odour of coal gas. One of the Gas Company's men on one occasion had admitted having smelt coal gas.

Mr. MILLER asked if it were not a fact that Post Office engineers had received definite reports of the presence of sewer gas in the tube.

Witness said that he had never received a report of the presence of sewer gas in the tube.

COUNSEL pointed to a report by a Post Office official in which the presence of sewer gas was referred to, and in which it was stated that it was considered dangerous for the men to work in it. With regard to the suggestion that coal gas had been found to be present in the tube, Mr. Miller examined the reports submitted to witness with regard to the tube, and said they showed that the Gas Company's representatives had not detected coal gas, but that the tube contained foul air.

The inquiry was then adjourned until Wednesday, Jan. 30.

Wednesday, Jan. 30.

Col. Thomas was still unable to be present on Wednesday, owing to illness.

The CHAIRMAN explained that Col. Thomas was reading the reports of the proceedings each day.

The ATTORNEY-GENERAL said that in the circumstances he would not suggest any interruption of the proceedings.

Mr. *Sinclair* (who had given evidence on Jan. 28), questioned by the CHAIRMAN as to the frequency with which the Post Office tube was opened, said he did not think that any considerable period had elapsed during which no one had been in the tube.

The CHAIRMAN said he had gathered that the tube had not been opened between Dec. 3 and Dec. 20, 1928—the latter being the date of the explosion—and apparently that was an abnormal period for the tube to be closed continuously.

Witness replied that on occasions it would be closed for longer than a fortnight. Generally speaking, when work was being carried out in the tube the manholes would be uncovered for the greater part of the day. The portion of the tube at the western end of the affected area—*i.e.*, near St. Giles' Circus—was not used anything like so frequently as the remainder.

Mr. TABOR called attention to a statement that on April 18 last a test made by means of a gas leakage indicator at a manhole in Shaftesbury Avenue indicated the presence of 27 p.ct. of coal gas in the air there. Apparently, he said, the previous date on which the tube was entered was March 26. He asked what steps were taken to ventilate the tube in April.

Witness replied that the plugs from the keyholes of the manholes were removed, at the request of the Gas Company.

Mr. TABOR asked if witness considered that this would provide sufficient ventilation, having regard to the percentage of gas present.

Witness pointed out that that percentage was indicated at only one manhole, and that the precautions taken were satisfactory. Tests at other points along the length of the tube had shown that the quantities of gas were trivial.

FUTURE EVIDENCE.

The CHAIRMAN intimated that the Commissioners intended to hear evidence from Prof. R. V. Wheeler; and it was felt that the best course would be for him to prepare a memorandum, after he had heard all the evidence, and for the Commissioners and the interested

parties to question him upon it. This memorandum would be in the possession of the parties a day or two before Prof. Wheeler would go into the witness-box.

It was also intimated that the Commissioners had asked the London County Council for evidence as to the handling of their pipe subways.

THE ATTORNEY-GENERAL'S SPEECH.

The ATTORNEY-GENERAL then indicated the nature of the evidence which would be given by expert witnesses on behalf of the Post Office, whose opinions, he said, wou'd be in conflict with those expressed by the witnesses of the Gas Company.

Counsel for the Gas Company, he continued, had thought it necessary to develop a severe attack upon the Post Office. He (the Attorney-General) was fortunate in being able to adopt a more detached attitude; so far from criticizing, he had no hesitation in saying that the Gas Light and Coke Company's very extensive undertaking was managed with great efficiency, and that the Company served the public in great difficulties, of which they themselves were now conscious, but had not perhaps been sufficiently conscious hitherto. So far as the after-effects of the explosion were concerned, it appeared to his untrained mind that the Gas Company and the other companies and public authorities concerned had grappled with great efficiency and despatch with a very unusual situation.

The purpose of the inquiry was not to discuss liability, but to try to arrive at the facts. The situation of the explosion was probably beyond controversy; there would be very little dispute, he imagined, that the explosion occurred in the tube or in chambers connected with the tube.

Without dogmatizing—as Counsel for the Gas Company had been inclined to dogmatize—he would indicate the probability, amounting almost to certainty, as a matter of scientific evidence, that it was coal gas that exploded.

The hypotheses as to the nature of the gas which exploded were three in number. The first was that it was petrol vapour. He understood that if petrol vapours exploded, unless they were homogeneous, one would expect to find heavy deposits of soot after the explosion, and that there would have been signs of black or comparatively thick smoke at the time of the explosion; but these signs were absent, according to the evidence. His witnesses would also give reasons for thinking that the colour of the flame would have been different if petrol vapours had exploded. From the evidence it would appear that the theory that petrol vapour was responsible was the most unlikely of the various theories advanced.

Discussing the second hypothesis, that gas due to anærobic fermentation was exploded, he said his witnesses would not suggest for a moment that anything stated by Prof. Haldane was not worthy of the greatest consideration; but possibly the theory that gas formed by anærobic fermentation had got into the tube would not have occurred to Prof. Haldane if he had heard all the evidence at the inquiry. The witnesses would agree that nothing which had been said by Prof. Haldane could be dismissed as impossible; all that he (Counsel) could hope to do was to indicate the preference which responsible persons had for the theory that coal gas had exploded. Prof. Bone himself had admitted the difficulty of visualizing the percolation into the tube of fermentation gas, generated in a wide region; he had thought that, if fermentation gas was the cause of the trouble, it must have been produced in a localized place, probably beneath or near the tube. This opinion was shared by the Post Office witnesses. It appeared also from the evidence given that there had been no discovery of the generation of this gas either before or after the explosion. So far the investigations made by the Post Office and the Gas Company had not produced any demonstrative evidence of the presence of this gas. The absence of any trace of hydrogen sulphide was of some importance. There had been no suggestion of the presence of that gas, which, he understood, had an odour of its own. Another difficulty was to understand how the gas, if generated, got into the tube. He gathered that the theory was that, whenever the barometric pressure fell, there would be an inflow of the gas into the tube. From an examination of the barometric chart, there did not appear to have been any violent rises or falls of barometric pressure immediately before the explosion; speaking from memory, he believed that at the time of the explosion it was rather higher than it had been immediately before.

He had understood Prof. Haldane to say that the generation of the gas was the result of the behaviour of organic matter in the soil, which was permeated with drains; he gathered that this meant that the ground was permeated with sewage, but there was no evidence of this.

Dealing with the third theory, that the explosion was due to coal gas, he said—and he emphasized that this observation did not reflect upon the honour or even the skill of the Gas Company or their officers—that the Gas Company had dismissed from their minds a little too hastily the possibility that this was an explosion of coal gas. Having set their faces in the direction away from coal gas, they were perhaps not sufficiently alive to inquire into the possibilities of coal gas being the cause; that was the only explanation he could give of their failure to discover the leakage on the 4-in. main, to which he attached some importance. It had taken the Company until Jan. 10 or 11 to find out about this leakage in the main; and apparently it had not occurred to the Company until comparatively recently that there were possibilities of an escape of gas much more important than they had realized. Mr. Lacey had expressed the opinion that a fracture such as had occurred in the 4-in. main would allow of an emission of gas amounting to tens of cubic feet per hour, and probably, if not certainly, not more than 50 c.ft. per hour. To test the value of that opinion, the Post Office authorities had made an experiment in which they had reconstructed the fracture as far as they could in a pipe of that size, placing the fractured parts so closely together that there was just sufficient space to allow a knife blade to be inserted (that being the description given of the fracture which had occurred in the 4-in. main). They had not been able to attain a pressure of more than $1\frac{3}{4}$ in. in the experimental pipe, but had found that the escape of gas from such a fracture at that pressure was 955 c.ft. per hour.

He did not suggest for a moment that it could be proved by circumstantial evidence to the satisfaction of every right-minded person that the explosion was obviously one of coal gas, but he believed that the evidence he would call would result in getting very near to that.

His witnesses did not accept the suggestion that coal gas would of necessity travel uphill, but would say that it would very likely percolate downhill, and that the escape of gas was amply sufficient to have caused the explosion. Prof. Bone's estimate that the quantity necessary to produce the explosion would be 3000 c.ft. was perhaps on the high side, but much would depend on the time of its entry into the tube. If the gas had entered two or three days before the explosion, it would be more likely to be stratified than to form a homogeneous mixture; if it had entered two or three weeks before the explosion, it was more likely that it would be in the form of a homogeneous mixture. In the latter form the presence of something in the neighbourhood of 3000 c.ft. would be necessary to cause an explosion; but if stratified, a smaller quantity would be required.

The part of the tube between Kingsway and St. Giles' Circus—*i.e.*, the part within the affected area—he continued, would cease to exist, so that any recommendations the Commissioners might make as to its ventilation would be in the nature of an academic report. North of St. Giles' Circus the tube had been entered; and so far as he knew there were no criticisms as to the sweetness of the air. It was owned by the Post Office, but tenanted, with them, by the St. Pancras Borough Council, who were electricity undertakers. The Post Office would continue to use the section of the tube east of Kingsway.

He submitted that it was probably almost unnecessary for the Commissioners to consider the responsibility or the faults, if there had been faults, in connection with ventilation. The tube was bought under statutory authority, because the Holborn Borough Council had found it impossible to allow the Post Office to open the roads for the purpose of laying their cables. The Post Office experts must be the best judges as to what ought to be done there. There was good reason for thinking that ventilation might be satisfactory for dispersing small leakages of gas, but it might be more dangerous than lack of ventilation if there were large escapes such as he assumed for the moment to have occurred in this case. Turbulence was a very important factor in changing weak explosive mixtures into strong explosive mixtures.

Finally, he said it was impossible to prevent gas escapes; and he asked the Commissioners to say that the theory which held the field, though not capable of proof by demonstration, was that the explosion was one of coal gas, and that the theory that it was fermentation gas, though ingenious, was not the right one.

EVIDENCE FOR THE POST OFFICE.

Col. *T. Purvis* (Engineer-in-Chief to the General Post Office) was the first witness; and he gave a brief account of the history of the tube and the acquisition of it by the Post Office in 1921 for the purpose of carrying telephone cables. It was regarded as the safest policy to keep ducts as air-tight as possible. It was necessary, however, to take precautions against accumulation of explosive gases from outside; and it was considered that the use of manholes to the street boxes was sufficient, because they were being constantly opened. The tube in which the explosion occurred in December last, however, was different; but it was believed that for ordinary purposes of ventilation the blower which was used was sufficient to ventilate it, in the interests of the men employed. It was necessary, however, both in ducts and in the tube to keep out water, because of the risk of electrolytic action on the lead casings of the cables. This was another reason for using more or less air-tight ducts. Every care was taken to report accumulations of coal gas to the Gas Company. As regards the use of open gratings to the Post Office tube or street boxes, Col. Purvis said that not only would these allow water to enter, but their use would also mean that small escapes of gas from the gas mains would be able to get away unnoticed, and the leak would not then be remedied; whereas at present the entry of a small leak of gas into a street box was immediately notified and remedied. Further, there would be dangers to the public if gas escapes were allowed to percolate through open gratings, and, on the other hand, there would be the danger of fire in the boxes or in the tube through carelessly dropped lighted matches and other possible causes. No suggestion had ever been made by the Gas Company for the ventilation of the tube to prevent danger from accumulations of gas; but the Post Office would have been pleased to consider any such proposals, and to carry them out, if practicable, at the expense of the Gas Company.

Mr. MILLER questioned Col. Purvis closely with regard to the policy of the Post Office not to ventilate its cable ducts, and was told that the primary reason was to keep the plant absolutely dry. Reference was made to the possibility of obtaining a ventilated manhole cover which would prevent water entering.

Witness said he had not yet been able to get one.

COUNSEL stressed the point that the ventilation provided in the Holborn portion of the tube by the Holborn Borough Council before the Post Office took it over had been removed by the Post Office subsequently.

Mr. *E. Gomersall* (Deputy Superintending Engineer of the London Engineering District, G.P.O.), dealing briefly with the regulations of the G.P.O., and the precautions to be taken by the workmen in the course of their duties, said that the men must be left to exercise a little discretion in the application of those simple regulations. Thrower had been down manholes frequently. The instructions were that, if a man knew of the presence of gas in a box or manhole, he must not use a naked light. It was obvious that Thrower had not suspected anything. If he had, he could have waited for the foreman, and transferred the responsibility to him. Witness then went

on to deal with the results of some exhaustive inquiries he had made as to the gas leaks which had occurred in the district during a period of two years and two months prior to the explosion. These indicated, he said, that sometimes the clearing-up of a particular escape or complaint occupied a very long time. He also referred to occasions on which blackened soil was noticed in excavations near gas mains, and said he had noticed it around the 48-in. main and the 24-in. main in this district on the occasions of recent excavations. He produced a mass of data obtained from the records of the Gas Company and of the G.P.O., together with some photographs he had had taken since the explosion. One of his exhibits was a map on which he had indicated where gas leaks had occurred, as shown by the Company's records; and his information showed, he said, that the number of leaks in this area was more than the 1·7 per mile of main as indicated by Mr. Lacey. He saw no difficulty about gas which had escaped from 216, Shaftesbury Avenue on Dec. 16 finding its way into the Post Office tube, nor did he see any difficulty about gas which had leaked from the 48-in. main finding its way into the tube.

COUNSEL referred to witness' statement that it was obvious that Thrower thought it was safe to descend into the tube, and pointed out that Mr. Sinclair, on the other hand, had stated that Thrower and his colleagues had gone to the manhole because the presence of gas was suspected, and with a view to dispersing it.

Witness suggested that Mr. Sinclair had merely intended to convey that, inasmuch as no one had been in the tube for a considerable time, it was thought necessary to blow it out before work was commenced.

COUNSEL, examining the information witness had compiled, and the map showing the points on which the alleged leakages had occurred, pointed out that some of the matters referred to were not leakages at all. Some of the entries in the Company's records showed that the work carried out by the Company's men was merely the clearing of water from service pipes, replacing broken valves, and so on; and he asked what was the use of indicating, by means of crosses on a map or plan, matters of that sort. He suggested that the document was valueless as an indication of the leakage occurring in the district.

Thursday, Jan. 31.

Mr. MILLER, in the course of further cross-examination of Mr. Gomersall, again referred to leakages of gas which, it had been suggested, had entered the Post Office tube and might have exploded there; and he stressed the point that the gas must have followed a very devious course if it had got into the tube. Counsel also exhibited a model showing the position of the Post Office tube, the sewers, and the mains at the point at which the 48-in. gas main crossed beneath the tube. At this point there was a syphon in the main. It was suggested on behalf of the Gas Company that, by reason of the relative positions of the main, the sewers, and the tube, any gas escaping from the main at that point would be more likely to enter the sewers than the tube; and it was pointed out that the explosion had damaged the top of one of the sewers.

Reference was made to a test carried out since the explosion; which test had disclosed that there was a leakage of gas from the syphon amounting to 6·99 c.ft. per hour. Mr. Miller, whose point was that the leakage was due to the explosion, put it to witness that an inevitable result of the explosion would be to transmit concussion to the joints of the main where it dipped down to the syphon.

Witness agreed that the explosion might have affected the joints to some extent.

In the course of further cross-examination the point was made that, if there had been an escape of gas to the extent of 7 c.ft. per hour throughout the whole 17 days during which the tube was closed immediately prior to the explosion, and assuming that the whole of the leakage found its way into the tube, the total quantity in the tube would be 2890 c.ft., which was only just about sufficient to produce explosive conditions. The leakage of 7 c.ft. per hour, however, was measured after, and not before, the shock of the explosion.

Witness, in re-examination, said that the figure of 7 c.ft. per hour did not include gas which might have leaked from two joints which were uncovered before the explosion.

Expert witnesses then gave evidence, on behalf of the Post Office, as to the probable cause of the explosion, on the lines indicated by the Attorney-General on the previous day.

Mr. *Harold Moore*, M.Sc. (Consulting Chemist), said he was convinced that petrol vapours could not have been responsible for the explosion. Under the conditions existing in the tube, petrol vapour there would be stratified; and if it were stratified, its explosion would create clouds of smoke. He could not conceive how gas was generated by anærobic fermentation in the soil in this case. Had the ground been saturated with sewage to such an extent as to account for the generation of sufficient methane to cause an explosion, he would have expected a noticeable smell of sewage in the surrounding district. He could not imagine its generation in one spot. There was no evidence of anærobic fermentation gas since the explosion. In view of the fact that the upper layers of the soil had been disturbed, if such gas were generated it could the more easily escape, so that its detection would be the more probable. Witness did not accept the theory that fermentation gas, if formed, was forced into the tube as the result of changes of barometric pressure, unless the quantities generated were very much larger than would be required to cause the explosion. The theory that the explosion was due to coal gas was by far the most probable one. Giving his reason for this view, he said that large quantities of coal gas were known to escape each year, as shown by the figures produced by the gas companies, and as evidenced by the blackening of the soil in the vicinity of gas mains. In his view, a quantity of 1000 c.ft. would be sufficient to cause an explosion; though he doubted if it would be so violent as the state of the ground at Holborn suggested that it was. Most probably the amount required would be more nearly 3000 c.ft., as suggested by Prof. Bone. He had no difficulty in assuming that sufficient quantities had escaped to cause the explosion. Gas escaping in an opening would rise; but if there were an obstruction above, it would travel downwards; in the absence of a means of egress in an upward direction, the gas would travel considerable distances in a downward direction when influenced by pressure from the main.

With regard to ventilation, he agreed with the view already expressed by other Post Office witnesses, that, though it would decrease the risks of explosions resulting from small gas escapes being allowed to accumulate, it might increase the risk of explosion if large quantities of gas entered the tube. Witness criticized the analyses of air taken from the ground since the explosion (submitted by Mr. Hollings) on the lines indicated by the Attorney-General in his speech to the Commissioners on the previous day.

Mr. MILLER, cross-examining, said that Mr. Moore's remarks with regard to ventilation would apply to ordinary subways just as they would apply to the Post Office tube; and yet other subways in London, as well as some sections of the Post Office tube itself, were ventilated.

Questioned with regard to fermentation gas, witness said he was not an expert on this—a statement which drew from Mr. Miller the pointed remark that he had nevertheless made a good many criticisms of the fermentation gas theory.

Cross-examination was then directed to the analyses of samples of dust taken from the tube by Mr. Moore. It was pointed out to him that in each case the ratio of carbon to hydrogen was roughly 5 : 1; and he was asked if the presence of those two constituents was consistent with the existence of hydrocarbons prior to the explosion. He replied that it was not.

LEAKAGE FROM A 4-IN. MAIN.

Mr. *W. G. Radley*, B.Sc. (member of the Research Section of the Post Office Engineering Department), gave evidence with regard to an experiment he had carried out to ascertain the amount of gas which would leak from a fracture extending round the whole circumference of a 4-in. gas main, in view of the evidence given, on behalf of the Gas Company, that the leakage from a fracture of that sort which had occurred in Shaftesbury Avenue would probably not exceed 50 c.ft. per hour. In his experiment a 3-ft. length of 4-in. diameter cast-iron gas pipe was cut into two portions by means of a hack-saw; the two cut surfaces being left rough. The two ends of the pipe were rendered gas-tight by the fitting of wooden plugs. With a pressure of 1¾ in. the leakage amounted to the equivalent of 955 c.ft. per hour. Had the pressure been as high as 4 or 5 in., he would have expected the leakage to have been three or four times as great. The gap was reduced to 10 mm., and the experiment repeated; and the leakage was equivalent to 619 c.ft. per hour. In a third experiment the pipe was mounted in a wooden box filled with soil from the excavations to a height of 13¾ in. above the centre-line of the pipe, and the width of the gap was opened to 22 mm. The leakage under these conditions was 586 c.ft. per hour. In a fourth experiment the soil was tamped tightly, as the result of which its height was reduced to 12 in. above the centre-line of the pipe. The width of the gap was 22 mm., and the leakage was 432 c.ft. per hour.

Mr. MILLER, cross-examining, pointed out that a fracture produced artificially would not bear much resemblance to a fracture in a pipe as it lay in the ground. The sawn ends of the pipe would be much smoother than the two ends of a pipe fractured in the ground, and would present less obstruction to the passage of gas. Moreover, a gas pipe in the ground would be firmly embedded in the soil. He had noticed, he added, that with a 22 mm. gap the leakage, when no soil surrounded the fracture, was 955 c.ft. per hour, but when loose soil was added the leakage was reduced by almost half. The result of tamping—and not a great deal of it—was to effect a further reduction of the leakage of from 20 to 30 p.ct.; and he suggested that, if the conditions were such as existed in a pipe embedded in soil under the pavement, it would be still further reduced.

Witness suggested that the fracturing of a pipe beneath the pavement was likely to be accompanied by some subsidence or looseness of the soil.

COUNSEL said that this would not necessarily be so. In any case, there had been no evidence of it.

Dr. *H. F. Coward* (Assistant Director of the Research Stations at Sheffield and Buxton of the Safety in Mines Research Board, who has been engaged for many years on research on the ignition and explosion of gaseous mixtures) expressed the view that the mixture which exploded at Holborn was a mixture of coal gas and air; and he agreed with Prof. Bone's estimate that about 3000 c.ft. of coal gas mixed homogeneously with air would form an explosive mixture sufficient to propagate flame through most of the length of that section of the Post Office tube in which the explosion had occurred. He corroborated Mr. Moore's evidence that the explosion was not due to petrol vapour or anærobic fermentation gas. He had carried out tests since the explosion, but had found no trace of sulphuretted hydrogen or anything which would indicate that fermentation gas was being generated. He suggested the coal gas theory was the correct one, because of the general experience that large volumes of coal gas escaped from the mains annually, as shown by the reports of the gas companies, by the need for constant repairs of mains, by occasional minor explosions due to gas leakage from mains, and by the blackening of the subsoil reported in the neighbourhood of gas mains. A second reason was that large gas mains lay near the Post Office tube, one or more of which had been found to be leaking, or to have been leaking, recently. He calculated that of the 49,000 million c.ft. of gas produced annually by the Gas Light and Coke Company, about 1 p.ct. might reasonably be considered as lost through imperfect joints or breakages in mains and supply pipes. This represented an average of 150 c.ft. of gas per day per half-mile of main. Many of the joints would not be leaking, but those that were would surely leak to a very much greater extent that was represented by the figure of 150 c.ft. per day per half-mile. Therefore,

he had no difficulty in accepting the proposition that coal gas might reasonably be thought to have been getting into the tube. The 4-in. main in Shaftesbury Avenue, inasmuch as it had been fractured, might readily be conceived to have contributed gas to the sandy soil, and perhaps ultimately to the tube, and to have made the air in the tube explosive throughout its length. There was also the leakage in the 48-in. main.

Mr. MILLER pointed out that leakage from the 48-in. main detected after the explosion was no indication of leakage prior to that explosion.

Witness said he considered the leakage from the 48-in. main, if at the rate of 168 c.ft. per day, as was detected subsequent to the explosion, might make a small contribution to the explosive conditions in the tube. Reiterating the views of previous witnesses as to the danger of ventilation in the event of a substantial leakage of gas into the tube, he said that he was not at all sure that the provision of even a forced draught would conduce to safety under those conditions. In this connection he pointed out that mining engineers, though utilizing strong ventilating currents, also adapted elaborate precautions against the ignition of gas which might evolve suddenly.

Questioned with regard to a statement that gas would not necessarily rise, but would follow the line of least resistance, he said that, if the pressure all round a pipe from which gas was leaking was equal, the gas would follow an upward direction; but if the line of least resistance were downward, it would flow in that direction. He disagreed with the suggestion that pressure from a main would be exerted for a distance of only a few feet round a main, and observed that it would be exerted for a distance of many yards.

The CHAIRMAN, referring to the suggestion that the amount of gas necessary to produce an explosive mixture in the tube would be less if it were in the stratified than if in the homogeneous condition, asked what was the minimum amount of coal gas necessary to cause the explosion in the most favourable conditions.

Witness replied that he imagined that a quantity of 1500 or 2000 c.ft. in the stratified condition would propagate a fairly violent explosion. The amount of anærobic fermentation gas required to produce the explosion, if in the homogeneous condition, would be about 3000 c.ft., as in the case of coal gas.

The CHAIRMAN said that, according to the evidence, there were two distinct explosions, and a considerable pause between them; and he asked what was witness's theory as to the course of events.

Witness said the best theory he could suggest was that the first explosion in the tube had broken a gas main, and that gas had escaped from that main and had entered, with air, into some cavity. This cavity was probably the Post Office tube, which had been broken by the first explosion, and from which some of the hot gases resulting from the explosion had been ejected. As the remaining products of the first explosion cooled, a partial vacuum would be produced in the tube, so that the gas and air would be sucked into it and fired by those remaining products of the first explosion.

Friday, Feb. 1.

At the commencement of Friday's proceedings it was arranged that the Commissioners and the interested parties should visit the Fulham Gas-Works of the Gas Light and Coke Company on Monday, Feb. 4, to see some experiments carried out showing the extent to which smell may be removed from coal gas as the result of its passage through earth, and also the extent, if any, to which earth will remove hydrogen from a mixture of methane and hydrogen. It was intimated by the Chairman that Col. Thomas hoped to be well enough to attend on that occasion, and that the public inquiry would be resumed, and should be concluded, on Tuesday, Feb. 5.

Dr. *Edward Ardern*, D.Sc., F.I.C. (President of the Association of Managers of Sewage Disposal Works, and Consulting Chemist to the Rivers Committee of the Manchester Corporation), gave evidence on behalf of the Post Office against the theory that the explosion was due to the ignition of anærobic fermentation gas. From a consideration of the facts he had been able to ascertain in this case, he considered that the theory provided a highly improbable explanation of the accumulation of inflammable gas in the Post Office tube. In the absence of information—which, he considered, could yet be obtained—however, he was prepared to say that the theory was entirely untenable. The facts he had obtained so far tended to show that there was no extensive pollution of the ground. He had failed to find evidence of any large or sensible area of anærobic fermentation. It seemed almost incredible that there should have been an extensive area undergoing anærobic fermentation, and that one should fail to find evidence of such a state of affairs. It was obvious also that anærobic fermentation could not possibly cease as the result of the explosion. The analyses of gas taken from the earth in the affected area afforded no evidence of anærobic conditions having obtained. The percentage of oxygen present in each sample was sufficient to prevent anærobic fermentation occurring.

Mr. MILLER said that, if one assumed that there was a certain amount of organic matter in the made-up ground, and a certain amount of sewage contamination in the deeper strata, and if one assumed also the exhaustion of the oxygen from the air, anærobic fermentation gas would be formed.

Witness said he had no hesitation in agreeing to that.

In the course of re-examination of the witness, it was mentioned that the Post Office authorities intended to bore, with a view to testing the fermentation gas theory; and it was stated that boring had actually commenced, but a sufficient depth had not yet been reached. Mr. Miller, however, pointed out the desirability of the Gas Company's representatives being present during such operations; and the Chairman agreed. Following a comment by Mr. Miller that it was obviously necessary to make a number of borings along the length of the tube, the Chairman said that, though this matter might best be decided by the engineers and chemists of the parties concerned, the view of the Commissioners would be that, if the results of the tests were to carry any weight, there should be a series of borings at equal distances apart along the length of the tube, so that it could not be suggested that the borings had been sunk at picked places. He suggested that the number of borings should certainly not be less than six, and that the depth should be a considerable distance below the tube—a depth of probably 4 ft. or so below the level of the sewer.

In the course of further discussion, Mr. Miller pointed out that if, as he had suggested, anærobic fermentation had occurred in patches, and not throughout the whole area of the ground, six borings might not be sufficient to indicate the facts. The Chairman said he agreed that sixty would be better than six, and six hundred better than sixty, but it was a question of what was possible. Mr. Murphy (Counsel for the Post Office) commented that the fermentation gas theory was put forward by the Gas Company, who ought not to put upon the Post Office the expense of carrying out elaborate boring operations; and he indicated that they would make six borings at fixed intervals, as suggested by the Chairman.

The CHAIRMAN said it was desirable to complete the public inquiry as soon as possible, and he did not wish to adjourn the proceedings indefinitely, pending the results of the boring experiments; he presumed there would be no objection to a statement, signed jointly by the parties, being handed to the Commissioners in this connection, and that it would not be necessary to hold another public sitting to hear the evidence with regard to it.

Another point raised by Mr. Miller was that, though anærobic fermentation might have been proceeding before the explosion, there might not be evidence that it was proceeding at present. The Chairman suggested another possibility—namely, that the explosion had disturbed the sewers, as the result of which there might be leakage of sewage into the soil at present which had not occurred prior to the explosion. He was afraid that these results would have to be read with some reservation.

Col. *T. Purvis* (Chief Engineer to the Post Office) was recalled to give evidence with regard to the ventilation of Post Office manhole chambers. The estimated average cost of ventilating a single road manhole chamber by an air duct to the footway and a pipe up the building line to a height sufficient to prevent danger of explosions due to the dropping of lighted matches, the flying of sparks from steam wagons, and such contingencies, was slightly over £25. There were roughly 40,000 roadway manhole chambers belonging to the Post Office throughout the country, so that the cost of ventilating them in that way would be something of the order of £1,000,000.

Mr. MILLER asked if the evidence suggested that the Post Office could not afford to ventilate the manhole chambers.

Witness said it did not.

Mr. *C. A. Baker* (Divisional Engineer in the service of the London County Council, charged with the supervision of the Council's pipe subways) gave evidence with regard to these subways, the total length of which was about 12,000 yards. They were ventilated, he said, throughout their length by pipe entrances and circular grids. The pipe entrances were from 10 to 12 ft. long and about 3½ or 4 ft. wide, and the diameters of the intermediate circular grids were from 24 in. to 26 in. In addition, there were a number of 12-in. circular ventilators over the manholes, through which services were taken into the houses. There were about 300 ventilators along the whole length of subways, and a similar number on the manholes, so that on the average there was a ventilator for every 20 yards of subway. The subways contained about 23,000 yards of gas mains, varying in size from 2 in. to 48 in., and in number from 1 to 3. If leakages were detected, notices were sent to the Gas Company. In 1927, 88 notices were sent, reporting gas leaks; and in 1928 there were 39 notices in respect of 52 leaks. In the latter year, however, the Victoria Embankment subway was flooded, as the result of which some of the large gas mains were displaced, so that extensive leaks had occurred, and the Gas Company was more or less in occupation of the subway for about four months, repairing the leaks.

Questioned by Mr. Murphy, he agreed that the subways were larger than the Post Office tube, the average width of the subways being about 9 ft., and the average height about 7½ ft.

Replying to Mr. Cyril Asquith (Counsel for the Gas Company), witness said that during the last twenty years the London County Council had not had to carry out any extensive repairs due to explosions.

The CHAIRMAN said he supposed that water mains, electricity cables, hydraulic mains, &c., would not float in the event of a subway becoming flooded, but that a submerged gas main would lift.

Witness replied that, on the occasion of the flooding to which he had referred, the gas mains in the subway had lifted except in places where this was prevented by other mains. Steps had been taken since that time to anchor the gas mains.

PROF. WHEELER'S STATEMENT.

Before the adjournment of the proceedings the memorandum which has been prepared by Prof. R. V. Wheeler, after he had heard the evidence given at the inquiry, was handed to the parties concerned, in order that they might have an opportunity of considering it before questioning Prof. Wheeler on the following Tuesday. Mr. Miller, discussing this memorandum, said that it appeared to him that Prof. Wheeler might be presenting to the Commissioners an entirely new view, and might have departed from the postulation that the explosion might have been due either to coal gas, anærobic fermentation gas, or petrol vapour, or of a mixture of those gases, mixed with air. If Prof. Wheeler were presenting an entirely new view, which the Gas Company had not had the opportunity of considering, the position of the Company would be rather difficult. Had he known of the possibility of another view being put forward, he would have called other evidence, and would have asked questions in addition to those he had asked. He would also have had the advantage of the assistance of Sir Dugald Clerk, who, unfortunately, was ill. Therefore, he was anxious to safeguard his future position in the event of a new view being put forward.

FELIXSTOWE GAS LIGHT COMPANY.

Shareholders Agree to Sale to Ipswich Gas Light Company.

At an Extraordinary General Meeting of the shareholders of the Felixstowe Gas Light Company last Monday, sanction was given to an agreement to sell the undertaking to the Ipswich Gas Light Company. The sanctions of the Ipswich shareholders and the Board of Trade have yet to be secured; but when they are, the Ipswich Company will be in the position to serve a large part of South-Eastern Suffolk, for only recently they purchased the undertaking of the Woodbridge Gas Company.

The terms of the provisional agreement are briefly:

The Ipswich Company shall: (*a*) Pay, satisfy, and discharge all liabilities of the Felixstowe Company as on July 1, 1929; (*b*) issue to the holders of the "A" stock of the Felixstowe Company £100 ordinary consolidated stock of the Ipswich Company, and pay in cash the sum of £65 for every £100 of such "A" stock; (*c*) issue to the holders of the "B" stock of the Felixstowe Company £70 of the ordinary consolidated stock of the Ipswich Company, and pay in cash the sum of £45 for every £100 of such "B" stock; (*d*) issue to the holders of the cumulative preference stock with a maximum dividend of 5 p.ct. £100 of the 5 p.ct. debenture stock of the Ipswich Company for each £100 of the said preference stock of the Felixstowe Company; (*e*) undertake the liability of the Felixstowe Company to redeem the issue of 7 p.ct. redeemable preference stock on July 1, 1932, and in the meantime, from July 1, 1929, pay to the holders of such stock the dividend thereon at and after the rate of 7 p.ct. per annum; (*f*) issue to the holders of the 5 p.ct. mortgage debenture bonds, £100 of the 5 p.ct. debenture bonds of the Ipswich Company for each £100 debenture bonds of the Felixstowe Company; (*g*) issue to the holders of the 4 p.ct. perpetual debenture stock, £80 of the 5 p.ct. debenture stock of the Ipswich Company for each £100 debenture stock of the Felixstowe Company; (*h*) undertake the liability of the Felixstowe Company to redeem the issue of 5½ p.ct. redeemable debenture stock on May 1, 1935, and in the meantime, from July 1, 1929, pay to the holders of such stock the interest thereon at and after the rate of 5½ p.ct. per annum; (*i*) undertake all liabilities of the Felixstowe Company in respect of the employees' pensions fund. The existing reserve fund of £1000 shall be at the disposal of the Felixstowe Company to deal with as they think fit. Provision has been made for the compensation of the Directors, one of whom, Mr. A. J. Haward, joins the Board of the Ipswich Company, and the Engineer and Secretary; and there are other terms dealing with the carrying-on of the Company's affairs pending the sanction of the Board of Trade and the transfer of the Company's undertaking.

The CHAIRMAN (Mr. E. H. Woodmancy), in moving the resolution adopting the agreement, said that Felixstowe was a rapidly developing place; and in order to get more money when the time arrived for extensions, the Company would have to go to Parliament for further powers, because their present powers had been exhausted. As a member of the National Gas Council, he knew that the modern tendency was for small companies to be absorbed by larger ones, because the larger concerns were able to produce gas more cheaply. In addition, it was known that the Board of Trade were in favour of such amalgamations. Their Vice-Chairman (Mr. A. J. Haward) had been offered a seat on the Board of the Ipswich Company.

Mr. A. J. HAWARD, in seconding, said that, if an amalgamation was to take place, this was the right time for it, because not only had they come to the end of their existing powers, but the time was not far distant when their works would have to be extended.

The resolution was unanimously agreed to.

WEYMOUTH GAS-WORKS INQUIRY.

An application by the Weymouth Consumers' Gas Company for a Special Order was the subject of a Board of Trade inquiry at the Guildhall, Weymouth, on Friday, Feb. 1. The Company asked, under section 10 of the Gas Regulation Act, 1920, for powers to extend their limits of supply to the rural parishes of Preston and Chickerell; to schedule new land for works extension; to vary the rate of dividend on preference capital; to fix a differential price for the added limits of supply; and to procure pensions and co-partnership schemes. Clauses 14 and 15, relating to power to create a special purposes fund and to a renewal fund, were withdrawn.

The inquiry was held by Mr. J. F. RONCA (Director of Gas Administration). Mr. Jacques Abady (instructed by Messrs. Dyson, Bell, & Co.) stated the case for the Company. Opposition was entered by the Weymouth Corporation (represented by the Town Clerk, Mr. Percy Smallman). The Weymouth Rural District Council, represented by Col. G. P. Symes, M.V.O., withdrew opposition upon the abandonment of clauses 14 and 15. Mr. J. Leslie Torr (Clerk to the Dorset County Council) asked for the insertion of clauses similar to those incorporated in the Swanage Gas Order of 1923, for the protection of main county roads and bridges. Mr. W. T. Wilkinson (Solicitor, of Weymouth) lodged objection on behalf of Mrs. D. M. Paull, the owner of a cottage in the vicinty of a site acquired for gas storage purposes at Broadwey.

Mr. ABADY, in his statement for the Gas Company, said that there did not appear to be great opposition to the objects of the Order generally. He explained that the Company had exercised power to acquire land by agreement from the Weymouth Corporation in the vicinity of their present works. There was no opposition to this. Dealing with the objection of Mrs. Paull, he stated that the land acquired for the gasholder at Broadwey appeared to be the only plot available. The extension of the limits of supply was not opposed; and in view of the opposition of the Corporation to clauses 14 and 15, he proposed to withdrawn them. (The Town Clerk here intimated that the Corporation proposed to continue opposition.) Mr. Abady mentioned that in 1897 the Company were authorized to extend their limits to Upwey and Broadwey, but they had not exercised their powers; the reason being that development had been slower than was anticipated. The Company had been unable to extend their works to keep pace with the growing demand. Even at the present time, it did not promise to be a very paying proposition to give a supply; but the Company proposed to embark upon the scheme, and also to supply Chickerell and Preston. The activities of the Company had been cramped in the past; and they took the view that they were entitled, so far as the renewal of the works and mains were concerned, to meet such renewal out of revenue. If the carry-forward and reserve were added to the available capital, the total would be just enough to cover the cost of the proposed new works, which involved an expenditure of £61,633. He was rather surprised at the Corporation objecting to this proposal, because an examination of the abstract of accounts published by the Corporation revealed that they had adopted exactly the same method in connection with their own electricity undertaking. Mr. Abady submitted that the grounds upon which the Corporation based their opposition were not at all clear, and he repudiated the suggestion that the Company's reserve fund was in excess of the authorized amount.

Mr. *John T. Joyce*, the Company's Engineer and Manager, stated that the maximum price was fixed at 4s. 6d. Under the Act of 1897, their limits were extended so as to include Upwey and Broadwey, and the capital was consolidated; the maximum price being fixed at 4s. for the original limits and 4s. 6d. for the two parishes. In 1922 the Company obtained an Order under the Gas Regulation Act, and the price was fixed at 14·6d. per therm for the original limits and 15·8d. per therm for the parishes of Upwey and Broadwey. In the pre-war period their price was 3s. per 1000 c.ft.; in 1915-16 and 1917, 3s. 6d.; and in 1918-21, 4s. The price was now 10d. per therm. Mr. Joyce confirmed Mr. Abady's statement that the capital of the Company was £100,677, and authorized unissued capital, £41,823. The sales had doubled since 1909, and the number of consumers had increased from 3599 to 6198. Dealing with the present works, Mr. Joyce said that they were shut-in on the north, south, and west. They made an application to the Board of Trade, in 1922, in respect of the foreshore. Negotiations with the Corporation followed, and an agreement was reached in 1927. The proposed expenditure was not only for extensions, but for renewal of the existing old works, with a capacity of 1 million c.ft. of gas per day. The amount standing to the credit of the revenue account in 1922, when application was made to the Board was Trade, was £6939, and at June, 1928, £16,517. It was proposed to erect a gasholder at the corner of Nottington Lane, Broadwey, near a cottage occupied by Mrs. Paull. This was the most suitable site. They had searched the whole of the area for alternative sites, but had been unable to acquire any other land. The cost of carrying the mains to Upwey and Broadwey was £9051 16s. 6d. The cost of the gasholder and foundations was about £5000. The figure for Chickerell was £7557, and for Preston, £5571. The estimated annual consumptions were: Upwey and Broadwey, 9,630,000 c.ft.; Chickerell, 6,630,000; and Preston, 2,850,000. The capital cost per million c.ft. was £1160 per annum. It would be as much as the Company could do to make both ends meet to charge a differential of 1·2d. per therm in the rural areas.

Mr. *Geo. Evetts*, Consulting Engineer, called on behalf of the Gas Company, stated that he had examined the figures, and was of the opinion that the differential price was justified. He considered that the Company would lose unless the development was carried further. The works were old, and required renewing. In his opinion, the proposed site for the gasholder was suitable. The holder would not be detrimental to adjoining property.

Mr. *Arthur Valon*, Consulting Engineer, gave evidence for the Weymouth Corporation. He expressed the opinion that the Company had three times more reserve than they were allowed under the Act of 1847. He agreed that the works had been well managed, and that the price of 10d. per therm was not high for a place like Weymouth; but he did not think that the differential rate of 1·2d. would be sufficient.

The TOWN CLERK, after statements had been made on behalf of the County Council and Mrs. Paull, made submissions for the Corporation. He remarked that the withdrawal of clauses 14 and 15 was not regarded as sufficient protection for the Corporation. It was agreed that the Gas Company was well managed; but he submitted that they were in such a prosperous condition that they should reduce the price of gas to the consumer.

Mr. ABADY, replying for the Company, pointed out that they had already applied revenue to the reduction of the price of gas. The charge was lower than in most seaside resorts. The Town Clerk had misquoted and misinterpreted the Acts, failing to differentiate between profits and clear profits, a standard price company and a sliding-scale company, and nominal capital and paid-up capital.

Mr. Ronca afterwards visited the sites.

BECKER COKE OVENS AT BEDWAS.

First Bricks Laid.

The newly-formed British Benzol and Coal Distillation Company, Ltd. (see JOURNAL," Vol. 182, p. 1008, and Vol. 184, p. 278), has under construction on a site adjoining the Bedwas Navigation Colliery at Bedwas a new coke and bye-product plant which is the first of its kind in the South Wales coalfield; and on Jan. 29 the first bricks of the new coke ovens were laid.

Among those present at the ceremony, which was informal, were Major-Gen. Sir Neill Malcolm, K.C.B., Chairman of the Company; Sir Samuel Instone, a Director of the Company, and Chairman of the Bedwas Navigation Colliery Company, Ltd.; Mr. Theodore Instone, Director, and Joint Managing Director of the Bedwas Navigation Colliery; Mr. G. R. Hall Caine, C.B.E., M.P., and Col. H. C. Woodcock, D.L., M.P., Directors of the new Company; and Mr. G. R. Jackson, Managing Director, also acting for Sir Arthur Duckham, who is at present in Australia.

Major-Gen. Sir Neill Malcolm and Sir Samuel Instone laid the first bricks of the new coke ovens. The constructional work, which is in progress, was then inspected, together with the surface plant of the Bedwas Colliery. There were no speeches. Lunch was afterwards served at the colliery offices.

The new plant will consist of 35 Becker high-temperature coke ovens, with a bye-product rectification plant. The new Company has contracted to purchase 750 tons of small coal a day from the Bedwas Navigation Colliery, and this contract will last for fifteen years from the time the new works commence operations. As the Bedwas Colliery employs about 2400 men, the effect of the arrangement is that the Colliery is assured of regular working for at least fifteen years.

PROPOSED EXTENSIONS AT THE TREDEGAR GAS-WORKS.

Ministry of Health Inquiry.

At an inquiry into an application to borrow £15,000 for the purpose of modernizing the plant at the Tredegar Gas-Works held by Mr. A. W. Mason, M.Inst.C.E., at Tredegar, on Jan. 30, Mr. D. Walter Davies, Past-President of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, and Manager of the Gas-Works, was the chief witness.

Mr. J. TREVELYAN PHILLIPS (Clerk to the Council) presented the case. He said the sales of gas had increased during the last two years. In 1927 they made 63,018,400 c.ft., and sold 53,144,700 c.ft.; in 1928 they made 69,806,100 c.ft., and sold 55,800,200 c.ft. There was a loss of about 17 p.ct. of the make due to subsidence following underground workings; but this was constantly being watched, and was decreasing.

Mr. *Davies*, in his evidence, said the last extension to the carbonizing plant was made in 1910. The present make of gas was 70 millions per annum, for which they had four beds of eight retorts each and two beds of six retorts each. In his opinion a reasonable number would be one retort for every million c.ft. of gas make, which showed that they were nearly 50 p.ct. short. They intended, under the new scheme, to substitute their present 44 horizontal retorts by six vertical retorts with a throughput of 24 tons per day. Owing to the inadequacy of the present retorts, they were unable to carry out their statutory obligations. For some time they had been unable to carry out the section of the Act relating to quality. Some of the settings were in such a condition that others had to be worked at such a high temperature that naphthalene resulted. The position caused him considerable misgiving. If the present application was not granted, the Council would have to carry out very extensive repairs. Every retort would have to be renewed, by which means the Council would be able to maintain the supply next winter, provided they did not connect extra consumers. Even then they would not be able to comply with the statutory requirements. To repair the present horizontal retorts would cost £1500 to £2000; but the naphthalene trouble was increasing to such a degree that they would have to instal a washer, increasing the cost by £500. For some years they had been using the same type of coal—Troedrhiwgwair coal—and the average yield of gas was approximately 55 therms per ton, and of coke 9¼ cwt. With vertical retorts the corresponding figures would be 81 therms and 11¼ cwt. It was proposed to displace two beds, each of six retorts; but the remaining four beds of eight retorts each would be kept as stand-by. There was a continual demand throughout the area for new appliances, though the Council did not push the demand, or canvass. Some time ago they ceased making installations. There was no margin for safety at the gas-works now, but under the proposed scheme there would be a margin of 35 p.ct. Their storage capacity was equal to a day's make. There were 4917 houses in the area, and roughly 3000 were supplied with gas.

Mr. *A. P. J. Gough* (Financial Officer to the Council) said the price of gas was fixed just to meet the expenditure. Of the money collected for gas sales—viz., £11,000 per annum—the arrears were only £200. Mr. Gough gave financial details relating to the Council's affairs, and said he had never had serious difficulty in raising money for Council purposes. The amount of money saved on the purchase of coal for the proposed new plant would more than meet any loan charges which would arise. He estimated a profit on the first year's working of £24, rising to £700 the second year, and increasing afterwards. The net profit on the present undertaking in 1927-28 was £1643, and the gross profit £3857.

Mr. *S. Filer*, O.B.E., J.P., Chairman of the Gas-Works Committee, and Mr. W. R. Hopkins, J.P., Chairman of the Council, supported the application; and there was no opposition.

The Inspector subsequently visited the gas-works.

COKE OVEN GAS FOR NEWCASTLE.

It is announced that the Newcastle-upon-Tyne and Gateshead Gas Company have entered into an agreement to take a quantity of gas from the new coke ovens recently completed by the Consett Iron Company, Ltd., at Derwenthaugh.

The contract extends over a period of years, and necessitates a reduction in the number of men usually employed at the Redheugh Gas-Works, Gateshead, as the gas is being brought to those works by a special pipeline. Having regard to the large amount of unemployment in the district, the Directors of the Gas Company naturally view with great concern the necessary displacement of men, and they have arranged to grant to men with a continuous service of not less than three years, for whom other work cannot be found, a temporary out-of-work allowance based on length of service, such allowance to supplement the Government unemployment pay. The Company also propose to anticipate the date of carrying out certain new work in the mains department, and to put it in hand this summer, so as to provide work for as many men as possible. It is expected that the supplies of coke oven gas will be available during this month.

COURSES FOR TEACHERS IN GAS SUBJECTS, 1929.

Gas Engineering and Gas Supply at Leeds.

If the number of suitable applicants is sufficient, the Board of Education will provide at the University, Leeds, from Thursday, April 4, to Wednesday, April 10, a Short Course for actual or intending teachers of Gas Engineering, Gas Supply, and subsidiary subjects in technical schools and evening institutes. The number of teachers to be admitted will be limited, and they will be chosen from those engaged in teaching in courses in Gas Engineering or Gas Supply, but not Gas Fitting. The course will include:

(*a*) Lectures and discussions on method of teaching.
(*b*) Practical work in blackboard drawing.
(*c*) Lectures and demonstrations in the University laboratories.
(*d*) Special lectures on modern problems in gas engineering and supply.
(*e*) Visits to works.

Hostel accommodation will be provided at Devonshire Hall at an inclusive charge of 8s. per head per day. Applications should be made to Prof. John Strong, C.B.E., The Warden, Devonshire Hall, Headingley, Leeds.

The Board cannot undertake to consider applications after March 1.

GRAYS AND TILBURY GAS COMPANY.

An Extraordinary Meeting of the Proprietors of the Grays and Tilbury Gas Company was held at the Cannon Street Hotel on Thursday, Jan. 31—Mr. COURTENAY C. S. FOOKS, Chairman of the Company, presiding.

The notice convening the meeting was read by the SECRETARY (Mr. Wm. F. Whittaker).

The following resolution was proposed by the CHAIRMAN, seconded by Mr. ALEX. A. JOHNSTON, Deputy-Chairman, and carried unanimously:

"That the Bill now submitted to this meeting intituled:
A Bill to provide for the transfer to the Gas Light and Coke Company of the Undertakings of the Grays and Tilbury Gas Company and the Pinner Gas Company, Ltd.; to confer various powers upon the Gas Light and Coke Company; and for other purposes,

be and the same is hereby approved subject to such additions, alterations, and variations as Parliament may think fit to make therein, and as the Directors shall approve."

MANCHESTER GASHOLDER ACCIDENT.

Special Committee's Report.

The Manchester City Council to-day will be asked to approve of the report which has been completed by the Special Committee appointed by the Council on Jan. 9 last to consider the report of the Home Office on the accident at the Bradford Road Gas-Works in August, 1927.

In the course of their report, the Committee say that, after considering the report of the Home Office representative, they see no reason why his conclusions should not be accepted as reasonable. The more important of their conclusions are as follows:

"After reading the criticism of the Inspector on the methods adopted in repairing the gasholders, your Committee feel that the inspection of the plant in recent years has been inadequate. The Inspector calls attention to special points which might be expected to have received careful consideration by a Chief Engineer, had there been such a person responsible to the Committee for the maintenance and working of the plant; and it may be that the risk which was being run in working the holders might have been disclosed. That is not, of course, to say that the accident would not have taken place; but it is evident from the report that, by failing to appoint a Chief Engineer, the Gas Committee incurred a very grave responsibility. In view of the fact that the report of the Inspector was at that time pending, it was, in the opinion of your Committee, unwise on the part of the

Gas Committee on June 22 last to make the important alteration in their administration which resulted in the appointment of a General Manager and Secretary.

"The Inspector stresses the desirability of the appointment of a Chief Engineer who should be responsible directly to the Gas Committee for the working and maintenance of the plant; and with this conclusion your Committee are strongly in agreement. He should be a man of the highest qualifications and widest experience in the gas industry. As the matter is one of extreme urgency, your Committee recommend the Council to instruct the Gas Committee to report to the Council at the March meeting the steps they propose to take with this end in view, and to indicate exactly what are to be his functions and duties, and those of the present General Manager and Secretary."

The report is signed by Alderman Titt, the Chairman of the Special Committee.

WOODALL-DUCKHAM COMPANIES.

Australian Branch to be Formed.

The "Financial Times" for Feb. 4 states that Sir Arthur Duckham, Chief of the British Economic Mission to Australia, announces the completion of negotiations for the formation of an Australian branch of the Woodall-Duckham Companies.

An existing Melbourne business has been purchased, and will form the nucleus of the Company now being formed. This will be financed with Australian capital, in addition to a proportion of its own money.

The initial capitalization will be £30,000, but this will be increased later. The business will be governed by Australian Directors, and Sir Arthur will be a member of the Board. The title of the Company will be Woodall-Duckham (Australasia), and it will operate throughout Australia and New Zealand.

The Company will manufacture the same class of products as the English Company, and will cover all types of fuel treatment, the cleaning and blending of coals, carbonization, and the manufacture of refuse destructors, kilns, furnaces, and other engineering plant.

RADIANT HEAT OF DIFFERENT WAVELENGTH.

Beneficial Effect of Shorter Infra-Red Rays.

The following is an extract from a letter by Prof. Leonard Hill published in "The Times" for Jan. 29 last:

Observation has shown that the visible and the shorter infra-red rays penetrate largely through the horny layer of the skin, and, absorbed by the living tissue and blood of the skin, have their energy turned over therein. By concentration of these rays on the skin of the arm it is possible to warm up the subcutaneous tissue even to 117° Fahr., as shown by means of a thermo-electric needle, before the limit of tolerance is reached. The longer infra-red rays have very little power of penetration, being absorbed by a film of water, or wet tissue, and so warm up chiefly the surface layers of the skin, and hence the warmth is conducted in. With such rays the limit of tolerance is reached when the subcutaneous temperature has been raised to about 110° Fahr., because the surface layers have become too hot to bear. The shorter infra-red and visible rays, by their penetration, excite flushing and sweating; and these natural reactions prevent over-heating and afford a much pleasanter sensation of heat than that afforded by the dark heat rays, which produce a dry, uncomfortable sensation of heat. Such uncomfortable heat is felt by some people when the face is exposed to any source of dull red or dark heat, whether it be steam, coal stove, gas fire, or electric heater. The oppressive feeling so induced is put down often to supposed escape of fumes or to excessive dryness of the air. But a screen in front of the face at once relieves the feeling; moreover, there are no fumes given off by either modern gas fires or an electric heater, and drying of the air has nothing to do with the sensation. This is in truth due to the nature of the radiant energy and its depth of penetration.

Some observations have been made with a new radiant designed for gas fires to give more visible and short infra-red rays. The light of a fire fitted with these radiants is yellowish, and the heat feels more pleasant. The maximum of the spectrum of the new fire is more towards the visible region than in the case of the old fire. If one comes indoors with cool, dry skin, and puts one's forearm in front of a fire fitted with the old red radiants, and the other forearm in front of the new fire and at a like distance, the heating energy of either being the same, one feels the new fire to be pleasanter and the skin to be less dry and burning. The heat of the new fire can be endured longer than that of the old fire. Acting through a thin screen of ice the new fire affected a thermopile more than the old fire, because more of the new fire's rays penetrated the ice screen.

It has been shown by the research workers in the Radiation laboratories, by means of a rock-salt spectroscope and thermopile, that a piece of pigmented, desquamated, horny layer of human skin transmitted about 40 p.ct. of the radiations from the new fire, while the epilated whole skin taken from the abdomen of a rabbit transmitted about 6 p.ct. when fresh and about 20 p.ct. when dry. Some pieces of thick normal human skin removed in an operation and freed from subcutaneous fat transmitted from 2 p.ct. to 4·5 p.ct. In the case of the sun and an arc the transmission is greater owing to the greater proportion of short infra-red and visible rays.

Much of the good resulting from sun treatment in the case of wounds and surgical tuberculosis can justly be ascribed to short infra-red and visible rays. These, as well as the ultra-violet rays, have a curative effect. The exposure of the naked body to a source of visible rays, such as an incandescent lamp or lamps attached to a bed cradle, may be useful in cases of shock and exhaustive disease; warmth so derived being of greater advantage than dark heat afforded by a warm room and hot water bottles. Moreover, with such warmth the window can be opened and effects of open air and sunlight treatment obtained. Overheating can be prevented by use of a fan, and the lamps adjusted in accordance with the patient's feelings.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There is still considerable activity in the market, all kinds of coal being in good demand. Large steams, both Northumberland and Durham, are the chief centre of interest, and the prompt demand for best coking sorts remains strong. While inquiry for forward positions is brisk, the higher quotations now prevailing are not encouraging much actual business. Gas coals, while enjoying average seasonal demand, have not participated to any great extent in the better market conditions of recent weeks, except in the case of some of the better second-class brands.

Nominal quotations are 15s. 3d. f.o.b. for Wear Special gas, and 14s. 9d. to 15s. for best qualities. Good seconds are 13s. 9d., and ordinaries 13s. 3d. Unscreened coking is well sold for early positions, and best qualities still ask 14s. 6d. to 14s. 9d. for prompt turns, which are very difficult to secure. Durham unscreened bunkers are maintaining recent improvement. Best qualities are well sold for several weeks, and firmly quoted at 14s. 6d. to 14s. 9d.; others asking 13s. 6d. to 14s. Northumberland screened steams are all stemmed for weeks ahead, and there is much better demand for smalls, stocks of which are now being reduced. Best screened qualities are firm at 14s. 6d. f.o.b.

Gas coke trade shows some improvement, but stocks are still reported to be considerable, and there is no change in the shipment quotation of 18s. 6d. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas coals are moving ordinarily under contract, and there is little surplus available. Industrial coal is inclined to appreciate somewhat, while the export section remains unaltered.

Recent demands for house coal have been maintained along with average prices. Some of the better qualities are in fair request.

The following are Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 18s. 9d. to 20s. 3d., export 16s. 6d. to 16s. 9d.; screened gas coal, export 16s. 6d.; washed trebles, export 16s. 6d. to 17s.; washed doubles, bunkers 18s. 3d., export 15s. 3d. to 15s. 9d.; washed singles, export 14s. 6d. to 14s. 9d.; washed smalls, bunkers 14s. 9d., export 11s. to 11s. 6d.; rough slack, bunkers 12s. 6d. to 13s., export 8s. 6d. to 9s.; smithy peas, export 17s. to 18s.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 17s. 3d. to 17s. 9d., export 15s. to 15s. 6d.; screened gas coal, export 15s. to 15s. 6d.; washed trebles, export 16s. to 16s. 6d.; washed doubles, export 14s. 9d. to 15s.; washed singles, export 13s. 6d. to 14s.; washed smalls, bunkers 13s. 6d. to 14s., export 10s. 6d. to 11s.; unwashed trebles, export 15s. 9d. to 16s.; unwashed doubles, export 13s. to 13s. 6d.; rough slack, export 9s. 3d. to 9s. 6d.; coking smalls, export 8s. 6d. to 9s. 6d.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 9d. to 20s. 3d., export 16s. 3d. to 16s. 9d.; cobbles, export 16s. to 16s. 6d.; washed singles, export 14s. to 14s. 6d.; washed smalls, bunkers 14s. 9d., export 11s. to 11s. 6d.; unwashed doubles, export 12s. 6d. to 13s. 6d.; rough slack, bunkers 13s. to 13s. 6d., export 9s. to 9s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. 6d. to 18s., export 13s. to 14s.; gas coke, export 21s. to 23s.; furnace coke, export 19s. to 19s. 6d.; washed steam (Goole, West Yorks.), bunkers 17s. 6d.; (Hull, West Yorks.), bunkers 18s.; (Hull, South Yorks.), bunkers 18s., export 14s. 6d. to 15s.

MIDLANDS.

Before collieries could fairly readjust prices on a frost-and-snow scale, the weather turned mild. With the run on particular grades of household coal relaxed it became an increasingly difficult matter to enforce irregular advances which had been notified. For the most part incoming orders were readily fulfilled.

Trading has tended to confirm the fear that the increased buying on industrial account after the turn of the year meant no more than that depleted resources were being renewed. Now that the first month has passed it is seen that if there is any increased consumption of fuel for manufacturing purposes the increase is very small.

Two or three weeks ago there was some little disorganization of prices owing to the pressure to sell "D.S." nuts. Spot lots were offered at special prices, which weakened the position of collieries that had no superabundance, but were anxious not to imperil the clearance of the supplies coming forward. This feature has now disappeared from the market. The stocks have been absorbed and the price level is restored. An average price for "D.S." nuts is 13s. or 14s. at the pithead. With the diversity of grades there is naturally variation above and below these figures. Slacks are steady; but there is no real stringency. They can still be obtained down to about 6s.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 4.

There is little animation in the tar products market, and the volume of business passing is very small. Values generally are as follows:

Pitch, about 36s. per ton.

Creosote, 6¾d. to 7d. per gallon.

Pure benzole, 1s. 9d. to 1s. 10d. per gallon; pure toluole, 1s. 11d. to 2s. per gallon; 95/160 solvent naphtha, 1s. 5d. to 1s. 6d. per gallon; and pyridine, about 4s. 3d. per gallon.

Tar Products in the Provinces.

Feb. 4.

All markets are unchanged, and prices generally are maintained.

The average prices of gas-works products during the week were: Gas-works tar, 22s. to 27s. Pitch—East Coast, 35s. to 36s. f.o.b. West Coast—Manchester, 30s. to 30s. 6d.; Liverpool, 32s. to 33s.; Clyde, 32s. to 33s. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1¼d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid, 4⅛d. to 4⅞d.; salty, 4¼d. to 4¾d.; Scotland, 4¼d. to 4¾d. Heavy oils, in bulk, North, 8¼d. to 8½d. Carbolic acid, 60 p.ct., 1s. 10d. to 1s. 11d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct. purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.		
Crude benzole . . .	0 10	to	0 10½	per gallon at works	
Motor ,, . . .	1 4	,,	1 4½	,,	,,
90 p.ct. ,, . . .	1 7	,,	1 8	,,	,,
Pure ,, . . .	1 10	,,	1 11	,,	,,

TRADE NOTES.

Gas Compressing Plant for Belfast.

The Belfast Corporation have accepted the tender of Messrs. Geo. Waller & Son, Ltd., Phœnix Iron Works, Stroud, Gloucestershire, to supply two gas compressing sets for the sum of £850.

Extensions at the Haddington Gas-Works.

The Directors of the Haddington Gas Company have decided, on the advice of their Consulting Engineer, Mr. Lawrence Hislop, F.C.S., to proceed with a scheme of works reconstruction involving a new carbonizing plant, the contract for which has been placed in the hands of Messrs. West's Gas Improvement Company, Ltd., of Manchester.

Stanton Concrete Products.

The Stanton Ironworks Company, Ltd., have published a booklet dealing with their various concrete products. Complete specifications, prices, and illustrations are given of concrete pipes and joints, manholes, flags, and kerbs. The Company also manufacture concrete-lined iron pipes which eliminate incrustation and decrease frictional losses.

Removal of Paint Spray Fumes.

Messrs. James Keith and Blackman Company, Ltd., have issued a pamphlet dealing with their patent fans for the removal of paint spray fumes. The employment of really efficient and reliable fans, they claim, not only disperses the dangerously poisonous fumes given off by all classes of interior paint spraying operations, but also results in quicker drying of the paint and in a better finish, thereby enabling more work to be done, and improving the appearance of the product.

CONTRACTS OPEN.

Coal.

The Prestatyn Urban District Council invite tenders for the supply of gas coal or nuts. [See advert. on p. 373.]

General Stores, Oil, &c.

The Rochdale Corporation Gas Committee invite tenders for the supply of lubricating oils. [See advert. on p. 372.]

The Tipton Gas Department invite tenders for the supply of general stores. [See advert. on p. 373.]

Pipes and Fittings.

The Rochdale Corporation Gas Committee invite tenders for the supply of cast and wrought iron pipes, &c. [See advert. on p. 372.]

The City of Bradford Gas Department invite tenders for the supply of steel mains and specials. [See advert. on p. 372.]

Purifier Boxes, &c.

The Middlesbrough Gas Department invite tenders for the supply of cast-iron purifier boxes and steel building. [See advert. on p. 373.]

Welding Pipes.

The City of Bradford Gas Department invite tenders for the work of jointing by welding 5500 yards of steel main. [See advert. on p. 372.]

Reduction in Price at Brierley Hill.—The Brierley Hill District Gas Light Company announce that the charge for gas will be reduced by ½d. per therm (or 2½d. per 1000 c.ft.) from the reading of the meters for the December quarter last.

Institute of Chemistry.—Examinations for the Associateship and Fellowship of the Institute will be held from April 8 to 13, and 15 to 20. The list of entries will close on Monday next, Feb. 11. Forms of application and full particulars can be obtained from the Registrar, 30, Russell Square, W.C. 1.

Sale of Shares at Bromsgrove.—Messrs. Chappell & Foster conducted a sale at Bromsgrove on Jan. 31, when the following shares in the Bromsgrove Gaslight and Coke Company were disposed of: Seven original shares, £15 2s. 6d. each; and thirty £10 "B" shares, carrying £7 10s. p.ct. of interest, payable on the original shares, £11 each.

Commercial Gas Company's Dividend.—The Directors of the Commercial Gas Company will recommend at the annual general meeting to be held on Feb. 14 the payment of a final dividend on the ordinary stock of the Company at the rate of 7 p.ct. per annum, less income-tax, for the half-year ended December, 1928, making, with the interim dividend paid at the rate of 5 p.ct. per annum, less income-tax, for the June half-year, 6 p.ct. for the year.

Tottenham and District Gas Company.—The Directors recommend the payment of the following dividends in respect of the half-year ended Dec. 31, 1928: At the rate of 5½ p.ct. and 5 p.ct. per annum on the preference stocks; and £6 12s. 6d. p.ct. per annum on the "Ordinary" stock; all less income-tax. The rate of dividend on the "Ordinary" stock is increased by 7s. 6d. p.ct. on that paid in respect of the corresponding period of 1927. The consolidated "A" and "B" stocks of the Company, as and from Jan. 1, have been converted into "Ordinary" and preference stocks.

Royal Society of Arts Competition of Industrial Designs.—Particulars of the sixth annual open Competition of Industrial Designs to be held at the Imperial Institute, South Kensington, London, S.W., in June, 1929, have now been issued, and can be obtained from the Secretary of the Royal Society of Arts, John Street, Adelphi, London, W.C. 2. Intending competitors must apply to the Secretary of the Society between May 1 and May 11 for the necessary entry forms, and the last day for receiving entries is May 27. In all, scholarships and prizes amounting to over £2000 are offered in connection with the 1929 competition.

Sale of Stock at Portsmouth.—At a sale by auction on Wednesday, Jan. 30, £1146 of the Company's 5 p.ct. maximum stock and £2500 consolidated stock were offered for sale. The sale was stated to be "*cum* dividend from Dec, 31, 1928." By this the vendors meant without the balance of the dividend which will be declared on Feb. 14 for the year 1928, and will be paid on March 1. One of the buyers of the consolidated stock claims that he is entitled to all dividends declared after Dec. 31, 1928. Nine lots of the maximum stock fetched 84½ p.ct., and three lots 85¾ p.ct. Five lots of the consolidated stock fetched 117½ p.ct., and twenty lots 117 p.ct. The buyer pays, in each case, the auctioneer's commission, the stamp duty, and the registration fees.

New Showrooms at Hebden Bridge.—The Hebden Bridge and Mytholmroyd Gas Board opened new showrooms and offices in Carlton Street, Hebden Bridge, on Jan. 31. The premises include a model kitchen, as well as displays of general heating, lighting, and power equipment, and an attractive frontage and window display space. The building includes staff offices and collectors' office. The Manager's office has been transferred to Crow Nest. The opening ceremony, which was attended by the members of the Board, members of the two District Councils concerned in the joint gas authority, and officials and gas engineers from various Yorkshire and Lancashire undertakings, was performed by Councillor A. Sutcliffe, Chairman of the Board, and was followed in the evening by a dinner at the White Horse Hotel.

We have received from Messrs. Gibbons Bros., Ltd., of Dibdale Works, Dudley, a useful office blotting pad, with diary at the side.

Considerable inconvenience was caused by an electric light failure in the shopping centre of Scarborough on the night of Jan. 31. The area was in darkness for two hours before the defect could be remedied.

The following advertisement was put in the local Press by the Barnet District Gas and Water Company—"Help the Miners. For every ton of coke you buy from us we have to buy 2 tons of coal from the collieries."

It was reported to a meeting of the Stoke-on-Trent City Council on Jan. 31 that sanction had been given by the Ministry of Health to borrow £20,000 for gas cookers, fires, and wash-boilers, and £7000 for cast-iron gas mains.

Mr. J. H. Ormerod, a clerk employed by the Accrington Gas Board, has completed fifty years' service. He commenced with the old Gas Company. For sixteen years he was at Accrington, and was then transferred to the Great Harwood Gas-Works.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME	Quotations. Feb. 1.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 30	5	5	Aldershot 5 p.c. max. C.	72—77	..	75—76½
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	73—76	..	74½—76
1,551,868	,,	Sept. 27	7	7½	Alliance & Dublin Ord.	99—102	..	100—101½
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	68—68	..	..
522,654	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	114—117	..	..
300,000	1	Oct. 11	1/1½	1/1½	Bombay, Ltd.	20/—22/-	..	21/6—22/.
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	12½—13½	..	13
500,050	10	,,	7	7	Do. B 7 p.c.	12½—13	..	12⅝—12 11/16
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11—11½	..	..
50,000	Stk.	Jan. 10	3	3	Do. 3 p.c. Deb.	55—58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	76—77
357,200	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	117
341,880	,,	,,	6½	6½	Do. 5 p.c. Con.	101—104	..	103½—104
1,287,500	,,	July 26	5	5	Bristol 5 p.c. max.	93½—94½a	..	..
855,000	,,	Sept. 27	7	8	British Ord.	115—118	..	113
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	115—120	..	..
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—76	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Dec. 6	8	6	Cape Town, Ltd.	8—9	..	..
100,000	10	Oct 25	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	73—78	+2	76
626,850	,,	July 26	6	6	Cardiff Con. Ord.	97—100	..	..
187,850	,,	Jan. 10	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Aug 16	6½	5	Chester 5 p.c. Ord.	90—95b	+1	..
79,185	1	Oct. 11	12/-	12/-	Colombo Ltd. Ord.	36/—38/-	..	37/-
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	21/—23/-	..	28/-
375,402	1	Oct. 11	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	24/9
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	22/3
2,073,280	Stk.	July 26	7	5	Commercial Ord.	100—103	+1	100—101½
475,000	,,	Dec. 20	3	3	Do 3 p.c. Deb.	56—59	..	58
600,000	,,	Sept. 27	11	11	Continental Union, Ltd.	118—123	—4	117—123
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	118—123	—4	118½—120
787,550	,,	Aug. 16	7	7	Croydon sliding scale	111—114	..	112
403,100	,,	,,	5	5	Do. max. div.	84—87	..	86
492,270	,,	Aug. 16	10	7	Derby Con.	115—120e	..	..
55,000	,,	Dec. 20	4	4	Do. Deb.	70—72e	..	..
209,000	,,	Aug. 30	5	5	East Hull Ord. 5 p.c.	75—78	..	..
1,002,180	10	Sept. 13	16	14	European, Ltd.	15—17	+1½	12½—17
18,703,480	Stk.	July 26	5/11½	5½	Gas Light & Coke 4 p.c. Ord.	20/—20/6f	+·/9	19/6—20/6
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	65—67	..	65—66¼
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	79—82	..	80—81
5,602,630	,,	Dec. 20	8	8	Do. 8 p.c. Con. Deb.	59—61	..	60½—60⅔
181,815	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—101	..	99½—101
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 30	6½	7	Hastings & St L. 5 p.c. Conv	95—100	..	..
258,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	75—80	..	..
70,000	10	Oct 11	110	110	Hongkong & China, Ltd.	13—14	..	13½
173,200	Stk.	Aug. 30	5	5½	Hornsey Con. 5½ p.c.	88—91	..	..
1,976,000	,,	Nov. 8	10	10	Imperial Continental Cap.	340—360	+70	275—365
228,180	,,	Aug. 16	8½	8½	Do. 8½ p.c. Red. Deb.	70—73	+2½	..
285,242	,,	Aug. 16	7	7½	Lea Bridge 5 p.c. Ord.	120—123	..	..
2,145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord.	91—92b	..	..
600,000	,,	Sept 27	7	7	Do. 7 p.c. Red. Pref.	101—103b	..	..
165,736	,,	Aug. 16	8	9	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54—57	..	..
75,000	5	Dec. 6	18	18	Malta & Mediterranean	5¼—6	..	5⅜
392,000	—	—	—	—	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb.	100—102	..	101½
641,920	Stk.	Nov. 22	17	15	Montevideo, Ltd.	97—100	..	..
2,061,815	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	17/9—18/3d f	+·/6	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	73½—74½d	..	..
691,705	,,	Dec. 20	8½	8½	Do. 8½ p.c. Deb.	68—69d	..	..
131,780	,,	Aug. 30	6/18/0	7/1/0	North Middlesex 5 p.c. Con.	102—107	..	..
200,000	,,	Nov. 22	7	9	Oriental, Ltd.	113—116	..	..
188,120	,,	Dec. 20	7½	8	Plym'th & Ston'house 5 p.c.	108—111	..	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	109—112	..	..
236,732	,,	,,	5	5	Do. 5 p.c. max.	80—83	..	..
2,334,464	1	—	—	—	Primitiva Ord.	26/6—28/6	+·/6	26/1½—28/3
244,500	100	Dec. 3	4	4	Do. 4 p.c. Red. Deb.	91—94	..	92½—95½
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	78—80*	..	..
416,345	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	78—80	..	79—80
150,000	10	Sept. 27	6	6	San Paulo 6 p.c. Pref.	8⅜—8½	..	..
1,736,968	Stk.	Aug. 30	—	—	Sheffield Cons.	106—107e	+1	..
95,000	,,	Jan. 10	—	—	Do. 4 p.c. Deb.	74—77e	+1	..
90,000	10	June 14	13	14	South African	4—6	..	..
6,609,895	Stk.	July 26	7½	5	South Met. Ord.	108 110	+1	108—110
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	112
1,895,445	,,	Jan. 10	3	3	Do. 3 p.c. Deb.	59—61	..	60
784,000	,,	Sept 13	6½	6½	Do. 6½ p.c. Red. Db.	101—103	..	102
91,500	,,	Aug. 16	8½	8½	South Shields Con.	109—110d	..	..
1,243,795	,,	July 26	6½	6½	South Suburban Ord. 5 p.c.	109—112	..	110½
368,887	,,	Dec. 20	5	5	Do. 5 p.c. Deb.	98—101	..	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max.	77—79	..	..
121,275	,,	Dec. 20	4	4	Do. 4 p.c. Deb.	72—75	..	..
250,000	,,	Aug 30	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	..
200,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	99—101	..	100
1,002,275	,,	—	—	—	Tottenham District Ord.	101—104	..	103
150,000	,,	July 29	5½	5½	Do. 5½ p.c. Pref.	96—99	..	98
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75—78	..	77
289,094	,,	Aug 30	6⅝	6⅞	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
88,890	,,	,,	5	5	Do. 5 p.c. pref.	87—92	..	..
50,000	,,	July 12	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	130—135	..	..
255,536	,,	,,	7	7½	Do. B 8½ p.c.	115—120	..	116
132,535	,,	,,	5/19/0	6½	Do. C and New	99—104	..	..
352,000	,,	,,	8⅜	8½	Do. Wimbledon 5 p.c.	108—113	+1	..
98,000	,,	,,	7⅛	7⅜	Do. Epsom 5 p.c.	117—122	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	90—95	..	..
83,416	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	57—60	..	57½
284,748	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	..	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	97—100	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle. e.—Sheffield. f—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.

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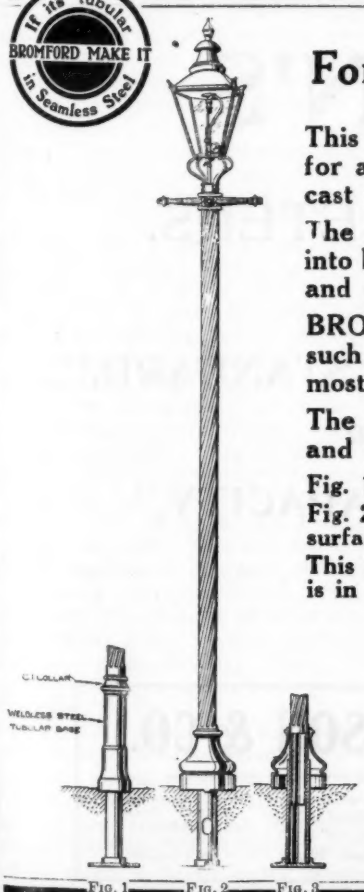

Fig. 1 Fig. 2 Fig. 3

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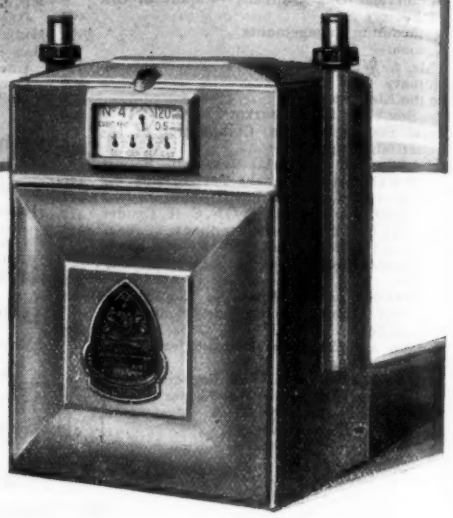

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VOL. CLXXXV., No. 3430.] WEDNESDAY, FEBRUARY 13, 1929. [81ST YEAR.

Editorial Notes.

The Largest Gas Company.

IT cannot be denied that there are more exciting events than a meeting of a gas company; but that is largely because, until more recent years, the career of a gas undertaking was uneventful. An increase in the make of gas per ton and a reduction in price were the two main topics which periodically came up for comment from the chair; and the bearing upon the business of these factors could be adequately gathered from the printed report of the proceedings. With the European war, and the senseless labour disputes by which the trade of the country was later so gravely imperilled, this state of affairs was altered; and developments of the industry in many directions have now brought about still further changes. In these circumstances, a gas company meeting need no longer be uninteresting, and, as a matter of fact, it seldom is so.

There are always matters of moment to which to refer; and the ever-widening limits within which gas stocks are held afford further reason for full explanation of doubtful points. These considerations impart an added importance to the periodical gatherings of proprietors. In the case of the more important undertakings, it has become the practice to ensure wide publicity for the statements of the chairmen; and in adopting this course there can be no doubt that they are benefiting not only themselves, but the industry as a whole. The more information that can be given to the general public about gas, the better. Those who wish gas out of the way have wasted quite a lot of breath—and printers' ink—in prophesying its early passing; and a gentle reminder now and again through the newspaper press of the fact that the gas industry is still hale and hearty, affords a useful antidote to these croakings. In this connection, a word of praise may, in passing, be fittingly bestowed upon the British Commercial Gas Association's advertisement on the back page of "The Times Annual Financial and Commercial Review" for 1928. This advertisement, by means of plain figures, emphasizes the fact, to which the "JOURNAL" has likewise drawn attention, that gas stocks possess great attractions for the investor who is desirous of putting "Safety First." The advertisement illustrates the progress of the industry, while "The Times Review" refers to the more or less general rise in the value of gas companies' stocks.

An excellent example of the matters to which we have been referring is to be found in the Gas Light and Coke Company, whose annual meeting was held last Friday, and is fully reported on later pages of this issue. The audience was a large and thoroughly appreciative one; and the Governor (Sir David Milne-Watson, LL.D., D.L.) was obviously as happy as the proprietors. On one side of the revenue account, he had to report a large saving in expenditure on coal and oil; while on the other he was able to draw attention to the fact that, by reason of a reduction in the price of gas, the amount received from the consumers had fallen to very nearly the same extent. This reduction enabled the Directors to declare a higher dividend, making a distribution of £5 11s. for the year. With the Company's stock purchasable at little over par, in £1 units, there would seem to be here a first-rate investment for both large and small amounts. More especially must this be the case when one bears in mind the Governor's emphatic remark "that there never was a time in the history of the Company when its financial position was in a sounder or healthier condition."

So much for the financial aspect. On the working side we find an increase of 1 p.ct. in the sale of gas, which, on the Company's huge business, represents no less than 500 million c.ft. Quite a nice little addition to the output of a gas undertaking! There is another figure, too, in the Governor's speech to which we would call the particular attention of those who profess to doubt the ability of the gas industry to hold its own, even in the field of street lighting. The number of public lamps has increased by over 500 in the course of the year. Readers of the "JOURNAL" have realized, from illustrated descriptions which have appeared from time to time, that the Company have been incurring large expenditure upon the fitting-up of handsome modern showrooms on central sites; and it will be particularly useful to other undertakings in whose areas a similar step may be in contemplation to learn that the Gas Light and Coke Company find their policy to have been fully justified. In other words, these showrooms have had the effect of making the public realize that modern gas appliances can be employed in houses however beautiful the decorations may be, and therefore they have been the means of securing a good class of business which the Company would not otherwise have been able to obtain.

Among a number of other important matters dealt with by the Governor was low-temperature carbonization. He announced the imminent introduction of a smokeless fuel named "Gloco," and the prosecution of investigation and research with a view to finding a new use for the tar and its constituents produced from this method of carbonization. At the present moment, the Directors are considering tenders for the installation of coke ovens at Beckton; and should the work be carried out, there is no doubt that both branches of the carbonization industry—gas-works and coke ovens—will benefit from the unique facilities for research that are now possessed by the Company. May we conclude with the expression of the hope, in connection with the attitude towards each other of these two branches of a great industry, that the friendly "gesture" of the Governor of the Gas Light and Coke Company to the coke oven industry will be reciprocated?

Accounts of the Commercial Gas Company.

THE Commercial Gas Company's district, being situated wholly in the industrial area of East London, is more affected by trade conditions than is the case of the neighbouring companies, all of which have a substantial area in the outlying suburbs from which they can rely on a steady and regular domestic demand. It is not surprising, therefore, if the Company's results show fluctuations from year to year.

The accounts just published for the past year show a gross profit of £139,808; and after providing for interim dividend, debenture and other interest, and for the final dividend recommended to be paid, there is a deficit on the year's working of £7939. The fluctuations referred to are illustrated by the results of the past five years:

Gross Profit.

Year.	£
1923	161,925
1924	102,777
1925	139,810
1926	132,042
1927	162,589

The average for these years—£139,830—is practically the same as the profit for the year 1928.

The Commercial Company's accounts are always closely watched by gas administrators for two reasons—the general excellence of their working results, and because the results obtained, due to the fact that the Company has no virgin soil to exploit, give a more reliable indication of the progress of the industry than in the case of other undertakings whose districts involve heavy capital expenditure without the certainty of profitable sales.

Having regard to the circumstances of the Company and the mild weather of last year, it is not surprising that the gas sales show a reduction of 2 p.ct. The coals carbonized reached a record figure of 282,095 tons, and cost 21s. 3d. per ton, as compared with 26s. 7d. per ton for the previous year. Only 5 p.ct. of water gas was made, and the gas produced per ton of coal carbonized averaged 72·89 therms. Coke made for sale was nearly 11¼ cwt. per ton coal; and this very satisfactory result, notwithstanding the lower average price realized of 20s. 7d. per ton, was largely responsible for the net manufacturing cost working out at a figure of 3·67d. per therm, which, so far as published accounts reveal, has not been beaten by any other London Company.

Comparing the principal items in the revenue account with those of the previous year, it is seen that—

	Gain. £	Loss. £
Coals and oil, &c., cost less by	80,387	
Residuals realized less by		39,758
	39,758	
Net coals and oil, &c., cost less by	40,629	
Carbonizing wages were less by	4,075	
Repairs and maintenance of works and plant were less by	33,117	
Distribution cost more by		14,938
Rent, rates, and taxes were less by	4,155	
Other items cost more by		1,967
	81,976	16,905
Deducting	16,905	
Leaves a net gain on expenditure of	65,071	
Gas and rentals, &c., realized less by		87,852
		65,071
So that balance to net revenue was less by		22,781
Dividends (interim and final) *plus* debenture and other interest, was less by	399	
		399
Which leaves a net reduction as compared with the 1927 figures of		£22,382

Of the reduction in the amount realized for gas and rentals, £85,282 is mainly due to a decrease in the price of gas from 10·4d. and 9½d. per therm in 1927 to 9d. per therm during the whole of 1928. The large decrease in the amount realized for residuals is due, of course, to the reduction in the market value of coke and tar prices. There has been a slight reduction in the number of consumers as shown by the meters in use, but there are 906 additional stoves at rentals.

Co-Operative Control of Coal Purchases.

MUCH interest has been aroused by the publication, in the "JOURNAL" for Jan. 23 last, of an extract from a paper on the "Co-Operative Control of Coal Purchases by Gas-Works" which was contributed by Prof. P. E. Raaschou, of Copenhagen, to the proceedings of the Second International Conference on Bituminous Coal which was held in Pittsburgh last November. In this, Prof. Raaschou outlined the scheme inaugurated by the Danish Gas-Works Association four years ago to ensure that all undertakings—small and large alike—could be supplied with full information regarding the virtues and vices of available coal supplies, thereby enabling them to purchase only those grades suitable for gas production and the manufacture of a uniform coke of good quality. This co-operative scheme has brought about a marked change in the general attitude of gas-makers—particularly those operating on a comparatively small scale—towards their raw material. Prior to its inauguration, far too much attention was paid to the volume of gas which would result from the carbonization of a coal, and far too little consideration was given to the type of coke simultaneously produced—whether it was well fitted to satisfy the requirements of local demands, and whether it was actually commanding its proper price.

The scheme itself is simple. Following a standardized non-elaborate method, every undertaking takes samples of every delivery of coal, and then these are tested in accordance with an equally simple prescribed plan. The results are sent to the Danish Gas-Works Association, who print all the data immediately, and distribute the information to all their active members. For four years the system has been operated with the greatest satisfaction; and its working has had two important effects in addition to the one already mentioned. It has acted as a spur to the coal suppliers to instal cleaning plant and exercise greater care generally; and it has forced the importers of coke to raise the quality of their product in order to remain on the market. In view of the excellent results attained, it is, as Mr. Harald Nielsen observed in a letter published in our "Correspondence" columns on Jan. 30, curious that the idea should have been first put into effect by a country which does not produce an ounce of black coal. Certainly a fundamentally similar scheme, though perhaps modified in detail, is worthy of sympathetic consideration by those responsible for the fortunes of the British gas industry.

M. J. Qvist, of the Dansk Gasværksbestyrerforening Dansk Gasbrancheforening (which corresponds to our Institution of Gas Engineers), has favoured us with details of the co-operative control scheme. In brief, any supplier must state distinctly the various brands of coal, and guarantee their maximum ash and water contents. For every unit of ash or moisture above the seller's guarantee, 1 p.ct. is deducted from the c.i.f. prices; similarly, for each unit of ash or moisture below the guarantee, the gas-works pay 1 p.ct. of the c.i.f. price. The samples on which the prices are based are taken at the point of discharge of the coal, and are analyzed at an approved laboratory; the procedure in each case, as already stated, being strictly specified. Last year, M. Qvist tells us, the idea of co-operative control was extended to coke sales in Denmark.

Points from the Cantor Lectures.

DURING the course of the Cantor Lectures on "The Treatment of Coal" delivered by Dr. C. H. Lander, Director of Fuel Research to the Department of Scientific and Industrial Research, before the Royal Society of Arts this year, the lecturer gave his opinions on the question of coal sampling; and in view of the fact that the Danish coal contracts are determined, as mentioned in the foregoing article, on analyses of samples taken at the point of discharge of the coal, his remarks are of added interest. He pointed out that often analyses are undertaken at two places—the exporting and the importing stations—and by different methods, with the result that the two sets of analyses are hopelessly inconsistent. Hundreds of thou-

sands of pounds sterling, he observed, have been squandered in lawsuits simply because of the difficulty of obtaining concordant results by sampling into and out of a ship. And regarding this matter, Dr. Lander's view is at variance with the specified conditions of the Danish Gas-Works Association, for he believes that sampling into a ship is the method which gives the most reliable results.

The foregoing opinion was expressed in the first Cantor Lecture, which was belivered on Jan. 21, and an abstract of which appeared in the "JOURNAL" for Feb. 6. In our issue to-day we publish an abstract of the second lecture of the series. In this Dr. Lander pointed to the outstanding change in gas-works practice brought about by the development of the continuous vertical retort, which now is responsible for about half the total gas production in this country. He assessed the relative merits of the horizontal and the vertical retort fairly, mentioning that, though the latter requires a higher grade of intelligent control, this cannot rightly be counted a disability. If it is so counted, we suggest that it is a tacit lack of faith in the skill of gas-makers, and something which ought not to be noised abroad. Also in the second lecture, Dr. Lander approached from an uncommon angle the question of benzole extraction on a gas-works. At present, he remarked, benzole-washing does not pay, because a therm of gas can be sold at a better price than a therm of liquid fuel. At the same time, if benzole were extracted, more coal would have to be carbonized, and thus the current consumption might require modification. Presumably Dr. Lander thinks that the increment of coke sales would enable the benzole to be sold more cheaply; but we incline to the view that the washing process must be regarded as a thing in itself. Certainly it would be difficult to discover the amount—if any—by which the benzole should be credited as a result of greater net coke revenue.

There will be general agreement with Dr. Lander's observation that, by adopting in suitable cases a centralized supply of clean producer gas for heating the retorts, the saving in repairs, and the better control secured, may more than pay for the loss of heat involved in not delivering hot gas direct from the producers—which loss, as was set out in the "JOURNAL" last week, in describing the installation of Woodall-Duckham continuous vertical retorts at the Saltley Gas-Works of the Birmingham Corporation, is not nearly so great as is commonly imagined; in that particular installation the producer gas, free from dust, enters the retort setting at a temperature *circa* 850° C. Outside producers, moreover, make it possible to deliver the gas under pressure, and thus obviate outleakage of coal gas from the retorts. This system has been investigated in connection with the horizontal retorts at the Fuel Research Station, and the results have been most favourable. The method is at present being tried out in at least one large gas-works.

In the third Cantor Lecture, an abstract of which will be published in the "JOURNAL" next week, Dr. Lander devoted his attention to the problems of low-temperature carbonization, and hydrogenation of coal under pressure. Work on the latter at the Fuel Research Station has revealed the interesting fact that the combination of an extremely small amount of hydrogen with a non-caking coal results in the formation of a product possessing very high coking properties. This discovery may be of great importance in the future.

Gas Light and Coke Company's New General Manager.

Readers will have been prepared by the intimation appearing in last week's issue of the "JOURNAL" for the announcement made by Sir David Milne-Watson at last Friday's meeting that Mr. R. W. Foot had been appointed General Manager. We join in congratulations to Mr. Foot upon a promotion which the cordial reception of the news by the proprietors showed to be popular.

From Secretary to Director.

Even after half-a-century's service as Secretary, the British Gas Light Company are not to lose the assistance which Mr. A. W. Brookes's good judgment and ripe experience are able to offer them; for they have appointed him to a seat on the Board. We are for two reasons pleased to have this announcement. In the first place, Mr. Brookes's influence in the industry extends beyond the confines of his own Company; and this influence will remain. Secondly, such a mark of appreciation of long and loyal service is highly gratifying to his many friends, among whom we desire to be numbered.

Our Industry Encourages Art.

Readers will be interested in details of the prizes offered by the British Commercial Gas Association and the South Metropolitan Gas Company in connection with this year's Competition of Industrial Designs organized by the Royal Society of Arts. This is the sixth annual competition, and, being open to all British subjects, is capable of discovering the best merit in the country. The "B.C.G.A." are offering a prize of 50 guineas for "a design for a fireplace for a room, and a gas fire of original design for use in connection therewith, properly ventilated into an adequate chimney flue," and another prize of 50 guineas for a design for a poster advertising gas. The South Metropolitan Gas Company are offering four prizes, each of 25 guineas, for designs of fireplaces incorporating the "Metro" coke grate.

COMMERCIAL GAS COMPANY.

Report of the Directors.

The following is the report of the Directors for the year ended Dec. 31, 1928, to be presented at the Ordinary Meeting of Proprietors to-morrow:

The revenue account shows a profit for the year of £139,808 9s. 1d., which, together with the balance of £53,344 13s. 11d. brought forward from the previous year, makes a total of £193,153 3s. After providing for the payment of the interim dividend for the June half-year at the basic rate of 5 p.ct. per annum, *less* income-tax, on the ordinary stock, and for the debenture and other interest, there remains a balance of £117,971 1s. 8d., out of which the Directors recommend the payment of a final dividend for the December half-year at the rate of 7 p.ct. per annum, *less* income-tax, making 6 p.ct. for the year, which rate permits the allocation of the sum of £20,732 16s. to the employee co-partners.

Mr. W. G. Bradshaw and Lord Marshall, two of the Directors, retire by rotation, and, being eligible, offer themselves for re-election.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Feb. 14.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting at the Council House, Birmingham. Paper by Mr. A. Forshaw, M.Sc., of Messrs. R. & A. Main, Ltd., on "Modern Cooker Ovens and Their Performance."

Feb. 16.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Cardiff. Paper by Mr. T. H. Madden.

Feb. 16.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Bradford. Paper by Mr. E. R. B. French, of Leeds, on "Water Heating Problems."

Feb. 19.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meetings of the Executive Committee and the General Committee, in Birmingham.

Feb. 19, 20, 21.—BRITISH INDUSTRIES FAIR.—Joint Conference under the auspices of the National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association, and the Society of British Gas Industries.

Feb. 23.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. J. G. Stein & Co., Ltd.

Feb. 25.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of the Finance Committee, in London.

Feb. 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

Feb. 28.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to the British Industries Fair, Castle Bromwich.

Feb. 28.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

March 5.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of the Lancashire Section of the Manchester District, in Manchester.

March 7.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Annual general meeting at the Grand Hotel, Birmingham, 2.30 p.m.

March 13.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Meeting at the Hotel Cecil. 2.15 p.m.

March 20.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

PERSONAL.

Mr. A. W. BROOKES.

A Director of the British Gas Light Company.

A well-deserved honour has been conferred upon Mr. Alfred William Brookes by the Board of the British Gas Light Company, Ltd., who have appointed him a Director to fill the vacancy recently created by the resignation of Major-General William Taylor Corrie, who had been a member of the Board for thirty-five years. Mr. Brookes relinquishes at the end of this month (and takes up his new position as a Director from

that date) the position of Secretary, which he has filled for over half-a-century. He is to be congratulated upon this well-merited reward for long and faithful service.

It will be recalled that in May last Mr. Brookes completed his fifty years of Secretaryship—an occasion which was taken advantage of by both Directors and officers to mark the high esteem in which he is held. This appreciation of Mr. Brookes exists outside the Company to no less extent than among those connected with the undertaking.

Mr. John Payne, of Tideswell, has been appointed Secretary of the Tideswell Gas Company, in place of the late Mr. F. F. Harrison.

A pleasant function took place in the Manager's Office at the City of Waterford Gas Company on Thursday, Feb. 7, when the employees made a presentation to Mr. T. C. Whimster, who has left to take up the position of Assistant Works Manager to the Spennymoor and Tudhoe Gas Company. The presentation took the form of a fitted attaché case, a fountain pen, and a loose leaf pocket-book. The Manager (Mr. F. J. Edmonds), in the absence of the General Manager (Mr. R. B. Anderson, of London), made the presentation, and Mr. Whimster suitably replied.

Mr. W. E. Plevin, B.Sc., who has been for some time on the staff of the Engineering Department of the Newcastle and Gateshead Gas Company, has been appointed a Shift Engineer to the Blackpool Corporation Gas Department.

OBITUARY.

We regret to have to record the death, which took place at York on Feb. 4, of Mr. James Melrose, who has been a Director of the York Gas Company for over forty-five years. On Aug. 5 last Mr. Melrose celebrated the hundredth anniversary of his birth, and the "Journal" for Aug. 15 contained an account of his many activities. The interment took place at York Cemetery on Feb. 7, and was preceded by a service in York Minster. Among those representing the Gas Company were Mr. Alfred Procter (Chairman) and Mr. H. E. Bloor (Engineer, Manager, and Secretary).

The death of Mr. Alan Reid, Engineer and Manager to the Brechin Gas Company, took place in a London Nursing Home on Monday, Feb. 4. Mr. Reid, who was serving a second term as Provost of Brechin, had gone to London as a member of a deputation from Scottish Burghs interviewing Members of Parliament regarding the De-Rating (Scotland) Bill. He became ill in his hotel, and was taken to a Nursing Home, where an immediate operation was performed. Septicæmia, however, set in, and death took place a week following the operation. A native of Brechin, Mr. Reid was fifty years of age, and had held the appointment of Manager of the gas undertaking since 1900. He was a member of the Council of the North British Association of Gas Managers. Of a genial disposition, he was well-known and held in high esteem by all his colleagues in the profession. The interment took place in the Brechin Churchyard on Feb. 7, and was followed by about 300 mourners. In the unavoidable absence of Mr. J. W. Napier, the President, the North British Association of Gas Managers was represented by the Senior Vice-President, Mr. David Fulton, of Helensburgh, and the Secretary, Mr. Archibald Kellock, of Airdrie. Among other Gas Managers present were Mr. James Dickson, of Dundee; Mr. A. C. Young, of Arbroath; Mr. H. Skea, of Forfar; and Mr. D. Macintyre, of Montrose. A service was held in the East United Free Church, of which Mr. Reid was a leading member, and was attended by a large congregation, including the Magistrates and Council of the City of Brechin; representatives of various local bodies with which the deceased was connected, and many prominent townspeople. Mr. Reid is survived by his wife; a son, who is engaged with the Woodall-Duckham Companies, in London; and two daughters.

The death occurred on Jan. 31, at her home at Greenhithe, Kent, of Lady Maybury, wife of Sir Henry Maybury, until recently Head of the Roads Department, Ministry of Transport.

As we go to press we learn with great regret of the death of Mr. P. G. Winstanley, the Engineer and Manager of the Wolverhampton Gas Company, which took place on Monday last.

ON THE ELECTRICAL SIDE.

The Test of Reliability.

If it is true that a public lamp is as good as a policeman, it must also be true that one of the most vital things about it is that it should be present when wanted. Should the authorities have pinned their faith to gas, the light will be there when required; but in this respect, electricity has its weakness. This is a question of fact, and not of argument. Failures of electricity have been with us from the first; it appears to be probable that they will remain with us to the end. This being so, the greater reliability of gas can quite fairly be made a point when questions of public lighting are under review; and to this end, it should always be borne in mind. Such a statement as "the three-phase, 50-cycle, 132-KV (between phases) overhead lines" may present its difficulties to the lay mind; but even the most unimaginative can picture the inconvenience, and even the danger, attaching to the sudden cessation of artificial light and power during the busy hours of the day. Numberless gas consumers in Paris must have found reason to congratulate themselves upon their foresight when, on Wednesday last, there was a failure of electricity during a dense fog. A short circuit on one of the main cables of the Saint-Ouen electric power station deprived no less than fourteen of the twenty arrondissements of Paris of electric light and power for the greater part of the day; the whole centre of the city being affected. A few days earlier, a mechanical defect in a turbine at the main power station at Hartshead imposed similar inconvenience upon the four towns of Stalybridge, Hyde, Mossley, and Dukinfield. Even tramcars which were left stranded in the streets had to be lighted with candles, as a precaution against collisions. Fortunately the police acted with promptitude, and posted men to regulate the traffic at dangerous crossroads. Owing, too, to a fault in a line near Forfar, the electricity supply in several neighbouring towns came to grief one day last week. Happily the cessation in this case was not a lengthy affair; but in reporting it, so far as Forfar is concerned, a local paper was able to point the moral, in the following statement: "The linking-up of Forfar with the Grampian scheme is a comparatively recent event, and there are only a matter of a dozen shops connected-up. Practically all of these have retained their gas fittings, and were able to revert to gas."

Where Gas Does Not Compete.

Reuter's Trade Service at Ottawa report a project which may well be left to those who have it in hand. The announcement is to the effect that the Canadian Federal Government have concluded a contract with Prof. Howard T. Barnes, of Mon-

treal, inventor of a thermo-electrical process of melting great bodies of ice, to keep the St. Lawrence River channel clear this winter between Montreal and Sorel, and thus advance the commencement of navigation in spring. The experiment, which is the largest of its kind yet undertaken, will involve an expenditure of $60,000. This does not appear to be an excessive outlay to secure so important an end.

Goods on Deferred Payment Terms.

From an article by Mr. Stanley M. Hills, in "Electrical Industries," it is learned that the Hotpoint Electric Appliance Company, Ltd., have developed an active sales policy to assist traders and supply authorities to sell vacuum cleaners, toasters, bowl fires, coffee percolators, irons, washing machines, ironing machines, cookers, &c. The Company will themselves undertake the financing of hire-purchase sales; the principle being the payment by the customer of a first instalment and the balance by monthly instalments. The charge for this facility is 5 p.ct. on the outstanding amount at time of purchase. Thus the "Premier" vacuum cleaner, cash price £15 15s., can be sold by hire-purchase for a first payment of £3 and twelve monthly payments of £1 2s. 8d., or alternatively the "Premier Junior" vacuum cleaner, cash price £8 17s. 6d., can be sold for 11 monthly payments of 17s. 6d. Further extended terms can be obtained for the Hotpoint-Maytag clothes washer, cash price £45, which may be sold for 12 monthly payments of £3 18s. 9d., or 24 monthly payments of £2 1s. 3d. On obtaining the first payment and signed order agreement, the seller—*i.e.*, supply authority or contractor—receives a credit note for the full trade discount; and should the customer fail to complete the payments, the only adjustment made is that the above-mentioned credit is reduced proportionately. That is to say, credit is given for the proportionate trade discount on the payments actually made by the customer.

In addition to the financing of hire-purchase sales for customers or agents, the Hotpoint Company will supply equipment for stock or showroom display on hire-purchase terms. Thus a dealer can obtain a representative stock of appliances, one of each, at list price, and can pay for them by twelve monthly instalments. By this means a good display can be made without placing a serious load upon resources; and at the same time the manufacturers will co-operate with the dealer in helping to sell the goods.

Stirring the Imagination.

A propaganda film which has been produced by the British Electrical Development Association was at first named "Rural Electrification;" but at a private view the audience were asked to suggest a more popular title. On the following day the prize-winning title was announced to be "Country Currents." We hope none of them will turn out to be "Stray Currents." The film is intended to demonstrate the possibilities offered by electricity to agricultural communities. There are no doubt a number of purposes on a farm to which electricity could be usefully applied; but the question of cost will in the vast majority of cases prove the deciding factor. Doubtless the farmer would like to choose for himself both his weather and his motive power; but one he has to take as it comes, and the selection of the other must perforce be governed by strict economic laws. "Country currents" may not prove to be the "plums" to the electricity supply authorities that the optimists are at the present moment inclined to imagine.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later pages.]

ALTHOUGH it was expected that the Bank Rate would be raised last week, the increase to 5½ p.ct. was rather a shock to the Stock Exchange. The markets are re-arranging their position to meet the new conditions, and values are gradually being marked down. The change in the rate is particularly unfortunate in view of the large number of new issues announced during the week-end, as it is bound to have an effect on the number and the values of the applications. There is little doubt, however, that the easing in the quotations of gilt-edged securities will give trustees the opportunity of securing a higher yield than has been possible lately.

The Gas Market continued in the same buoyant state that has prevailed for the past six weeks. It will be seen that Imperial Continental capital stock advanced another 60 points to 400-420, which compares with about 170 in the middle of December. The market is still without information as to the reason for this great rise in value. The interest in the other Continental companies seems to have subsided. Continental Union was marked down 1 point, and there was no change in the quotation of European shares. There was, however, considerable interest shown in the Wandsworth Company's stocks, doubtless due to the application to Parliament for basic price powers. The transactions recorded were few, but the quotations of the various stocks were marked up from 4 to 15 points. Among the other changes during the week, the rise of 7 points and 3 points in Portsmouth consolidated and 5 p.ct. maximum respectively, and 3½ points in Oriental ordinary, is noticeable. Dividend announcements for the past half-year have been made as follows: Croydon sliding scale, 7 p.ct. per annum, against 6¾ p.ct.; South Suburban 5 p.ct., 6½ p.ct. per annum, against 6½ p.ct.; Newcastle consolidated, £5 7s. 6d. p.ct. per annum, against 5 p.ct.; Bristol ordinary, 5 p.ct. per annum, against 5 p.ct.; Cardiff consolidated, 6 p.ct. per annum, against 6 p.ct.

The following transactions were recorded during the week:

On Monday, Aldershot 77, Alliance and Dublin 100, Bournemouth "B" 12¾, Commercial 100, Continental Union 117, 120, Croydon max. div. 87, European 16¼, 16⅜, 16½, 16⅝, 16¾, 16⅞, 17, Gas Light and Coke 20s. 2½d., 20s. 3d., 20s. 4½d., 20s. 6d., 3 p.ct. max. 65¾, 4 p.ct. pref. 80, 80¾, 5 p.ct. deb. 101, 101¼, Imperial Continental 345, 346, 347, 349, 350, 351, 351½, 352, 352½, 353, 354, 355, 356, 357, 358, 359, 360, Metropolitan (of Melbourne) 5½ p.ct. deb. 101½, Oriental 120, Primitiva 27s. 3d., 27s. 4½d., 27s. 6d., South Metropolitan 108½, 109. Supplementary prices, Barnet District 4 p.ct. deb. 79, Folkestone 82.

On Tuesday, Alliance and Dublin 101, 4 p.ct. deb. 66, Bournemouth 5 p.ct. 13, "B" 13, Continental Union 117, 118, 118½ 119, 7 p.ct. pref. 118, European 16½, 16⅝, 16¾, 16⅞, Gas Light and Coke 20s. 1½d., 20s. 3d., 20s. 4½d., 20s. 5¼d., 3½ p.ct. max. 65½, 3 p.ct. 60⅛, 5 p.ct. deb. 101, 101¼, Imperial Continental 346, 347, 348, 349, 350, 351, 351½, 352, 353, Metropolitan (of Melbourne) 5½ p.ct. deb. 101½, Primitiva 27s. 3d., 27s. 4½d., 27s. 6d., 27s. 7½d., 27s. 9d., South Metropolitan 110, 3 p.ct. deb. 60, South Suburban 5 p.ct. 109½, Wandsworth "B" 130½. Supplementary prices, Mid-Kent 75s., Petersfield and Selsey 23s. 9d., Watford "B" 95.

On Wednesday, Alliance and Dublin 101, Bournemouth 5 p.ct. 13¼, British 117, 118, Commercial 102, European 16½, 16¾, Gas Light and Coke 19s. 6d., 20s. 1½d., 20s. 2¼d., 20s. 3d., 20s. 4½d., 20s. 6d., 3½ p.ct. max. 65½, 5 p.ct. deb. 101¼, 101½, Imperial Continental 347, 348, 349, 349½, 350, 351, 351½, 352, 352½, 353, 354, 355, 356, 357, Metropolitan (of Melbourne) 5½ p.ct. deb. 101½, Primitiva 27s. 1½d., 27s. 3d., 27s. 4½d., 27s. 9d., South Metropolitan 110, 6 p.ct. pref. 112, 3 p.ct. deb. 61, 6½ p.ct. deb. 101¾, Tottenham 4 p.ct. deb. 78, Wandsworth "B" 130.

On Thursday, Bournemouth 7 p.ct. max. 12¼¼, Commercial 3 p.ct. deb. 58, Continental Union 117½, 7 p.ct. pref. 117½, European 16⅛, 16¼, Gas Light and Coke 20s. 1½d., 20s. 3d., 20s. 3¾d., 20s. 4½d., 20s. 6d., 3½ p.ct. max. 65½, 5 p.ct. deb. 101¼, 101½, Hornsey 3½ p.ct. 90, Imperial Continental 350, 352, 354, 355, 357, 358, 359, 360, 361, 362, 363, 364, 365, 365½, 367, 368, 369, 370, 372½, 374, 375, 376, 377, 378, 379, 380, 382½, 384, 386, 387, 388, 389½, 390, 393, 397, 398, 400, Primitiva 27s. 4½d., 27s. 6d., South Metropolitan 109, 109¾, 3 p.ct. deb. 59, 60. Supplementary prices, Folkestone 82½.

On Friday, Barnet 7 p.ct. maximum 115½, Bournemouth 5 p.ct. 13, 6 p.ct. pref. 11¼, Bristol 5 p.ct. 92, Continental Union 117, 118, European 16¼, 16⅞, 16½, 16⅝, 16⅝, 16¾, Gas Light and Coke 19s. 10½d., 20s., 20s. 1½d., 20s. 3d., 20s. 4½d., 4 p.ct. pref. 80¼, Imperial Continental 386, 387, 388, 390, 391, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 407½, 408, 410, 411, 412, 414, 415, 417, Liverpool 7 p.ct. pref. 102⅝, Maidstone 5 p.ct. 127, 129, Portsmouth 4 p.ct. 116, 5 p.ct. max 83½, Primitiva 27s., 27s. 3d., 27s. 6d., 27s. 9d., 4 p.ct. con. deb. 79½, South Metropolitan 108½, Wandsworth, Epsom 5 p.ct. 133¼, 134. Supplementary prices, Watford "B" 94.

Money was fairly plentiful in Lombard Street at the week-end, but rates were, of course, higher. After 4½ p.ct. had been quoted for both old and new loans, the rate eased to 4¼ p.ct. Treasury Bills were allotted at £5 2s. 5·68d. p.ct., or 17s. 2·85d. p.ct. above the previous week's average, but only £32,000,000 were allotted.

The tendency of the Foreign Exchanges was generally in favour of sterling. The main feature was the weakness of the French franc, the rate rising to 124.31¼. The German rate closed slightly higher at 20.46½; and the dollar exchange at 4.85 11/16. Belgian, Italian, and Dutch exchanges also moved in favour of this country; but there was a slight rally in Pesetas to 31.01.

Silver was easier on Chinese selling, the price declining to 25 7/16d. per oz.; but Gold was again quoted at 84s. 11½d. per oz.

The Bank Rate is 5½ p.ct., to which it was raised from 4½ p.ct. on Feb. 7. The Banks' deposit rate is 3½ p.ct., and the deposit rates of the discount houses are 3¼ p.ct. at call and 3¾ p.ct. at notice.

ROYAL SOCIETY OF ARTS.

Competition of Industrial Designs, 1929.

Particulars of the Sixth Annual Open Competition of Industrial Designs to be held at the Imperial Institute, South Kensington, S.W., in June next have now been issued, and can be obtained from the Secretary of the Royal Society of Arts, John Street, Adelphi, W.C. 2. Intending competitors must apply to the Secretary of the Society between May 1 and May 11 for the necessary entry forms, and the last day for receiving entries is May 27. In all, scholarships and prizes amounting to over £2000 are offered in connection with the 1929 Competition.

PRIZES OFFERED BY THE BRITISH COMMERCIAL GAS ASSOCIATION.

The British Commercial Gas Association offer a prize of 50 guineas for a design for a fireplace for a room, and a gasfire of original design for use in connection therewith, properly ventilated into an adequate chimney flue. Competitors desiring further details can obtain any particulars they require from the Secretary, British Commercial Gas Association, 28, Grosvenor Gardens, S.W. 1. The winning design will become the property of the B.C.G.A."

The Association also offer a prize of 50 guineas for a design for a poster advertising gas, preferably one symbolizing the fact that gas is the purified essence of coal and the source of light, heat, and power. Competitors must bear in mind not only the artistic, but the "selling," point of view. The design should be not less than double crown, and the colours should not exceed five, unless in special circumstances.

PRIZES OFFERED BY THE SOUTH METROPOLITAN GAS COMPANY.

The South Metropolitan Gas Company offer a prize of 25 guineas for the best designs of fireplaces incorporating the "Metro" coke grate in each of the following four sections.

Drawings submitted should be on double elephant size paper (40 in. by 27 in.). They should include a front elevation, plan, and one cross-section, and should be to the following scale: Section (*a*) full size; section (*b*) quarter size; sections (*c*) and (*d*) half size. The prize-winning designs will be the property of the South Metropolitan Gas Company.

Section (*a*).—A grate front only, to be of modern design. This grate is to be used to replace the existing coal grate in a register fireplace with cast-iron interior, or to replace the coal well grate in a modern tiled surround. A design for the front of the grate only is required; and this must be capable of withstanding a high temperature. The design must be such that it can be executed in cast iron, and must fulfil certain conditions and dimensions which are an integral part of the principle of the appliance. These conditions, together with photographs of existing designs, will be supplied by the Secretary, South Metropolitan Gas Company, 709, Old Kent Road, S.E. 15.

Section (*b*).—A modern fireplace to include a "Metro" coke grate. This design should include the surround, and may, if desired, include the mantel. The surround may be of any suitable material—glazed tiles, stone, brick, &c.—but the nature of the material should be stated. Detailed conditions will be supplied by the Secretary of the Company.

Section (*c*).—A self-contained fire for solid fuel incorporating the principles of the "Metro" coke grate. The fire is to be constructed of cast iron with firebrick interior, and is to stand in front of an existing fireplace with a flue outlet connecting to the chimney opening in a similar manner to a gas fire. Detailed conditions will be supplied by the Secretary of the Company.

Section (*d*).—A basket grate incorporating the principles of the "Metro" coke grate. The design should be one that can be executed in either cast or wrought iron. Detailed conditions will be supplied by the Secretary of the Company.

SCIENTIFIC AND INDUSTRIAL RESEARCH.

Report of the Department for the Year 1927-28.

The report of the Committee of the Privy Council for Scientific and Industrial Research covering the period from Aug. 1, 1927, to July 31, 1928, which is the thirteenth of the series, has been published at the price of 4s. net by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2. During the year under review the Committee received recommendations from the Advisory Council on the programme of research for 1928-29, for which, and for administrative services, they have drawn net estimates amounting to £446,220, as compared with £451,951 for 1927-28, and £442,877 for 1926-27.

Mention is made of the fact that the Hon. Sir Charles Parsons, K.C.B., F.R.S., one of the original members of the Fuel Research Board, retired during the year, and Sir William Larke, K.B.E., Mr. G. A. Hebden, and Engineer Vice-Admiral Sir R. Dixon, K.C.B., were appointed members of the Board. The death of Mr. L. Gaster caused a vacancy in the Illumination Research Committee, which was filled by the appointment of Mr. J. S. Dow. Dr. J. S. G. Thomas retired from this Committee, and Mr. J. G. Clark was appointed a member.

LOW-TEMPERATURE CARBONIZATION.

The thirteenth annual report of the Advisory Council, which is submitted with the report of the Committee, states that methods of carbonizing coal at low temperatures have advanced a further stage, and several processes are now being operated on a scale large enough to provide reliable data by which the possible limits of commercial success can be judged. The plant which is being erected by a Subsidiary Company of the Gas Light and Coke Company to try out on a commercial scale the experimental retorts developed at the Fuel Research Station is expected to be in working order early next year [*i.e.*, in 1929]. "The progressive spirit of the gas industry," continues the report, "has been further exemplified this year by the completion of the large and well-equipped research laboratories of the Gas Light and Coke Company, which were formally opened in July last by Sir Richard Threlfall, Chairman of the Fuel Research Board. In the course of his interesting speech on that occasion, Sir Richard pointed out that practical experience showed that it was still possible by scientific work to increase the efficiency of the horizontal retorts which have been used by the gas industry for a century. 'There is hardly any industrial operation,' he added, 'perhaps no such operation at all, which would not benefit if it were systematically investigated'—a remark which we quote to add point to our views on the necessity of applying the latest scientific methods for the continuous improvement of what has become in course of time the standard equipment of the basic industries."

HIGH-PRESSURE GAS RESEARCH.

It is mentioned that, in 1926, grants were made by the Department to assist Prof. Bone in the prosecution of his researches on gaseous reactions at high pressures. The grants were used for the payment of the salaries of research workers engaged as assistants to Prof. Bone. In 1927, when an expansion of the work was contemplated, Imperial Chemical Industries, Ltd., agreed to provide a capital sum for the equipment of a high-pressure research laboratory at the Imperial College of Science and Technology, and an annual sum for running expenses, exclusive of staff, for a period of three years. The Department has continued to assist in the development of the work by making grants to the College to enable four scientific assistants and one mechanic to be engaged. During the year systematic determinations of the influence of pressure upon dissociation in high-pressure explosions have been continued in order to obtain further data for the mathematical analysis of the specific heat of various explosion products. Further spectrographic investigations have been undertaken to determine the extent of the formation of nitric oxide as the result of explosions at high initial pressures of mixtures of carbon monoxide with excess of air. The influence of pressure upon the limits of explosion in various mixtures between pressures of 10 and 125 atmospheres has been determined, and the influence of moisture in the case of carbon monoxide and air mixtures at initial pressures of 32 and 64 atmospheres. In addition, work has been carried out on the influence of water vapour and hydrogen upon carbon monoxide and air explosions at high pressures and a temperature of 100° C. A great number of compressibility determinations, especially in connection with gaseous mixtures, has also been made. Lastly, investigations have been commenced on catalytic reactions at high pressures.

WORK IN CONNECTION WITH THE GAS INDUSTRY.

The main work during the year was a systematic investigation into the effect of grading the coal as to size, both on the products obtained and the ease of working, in the vertical and horizontal gas retorts at the Fuel Research Station. The effect of increased throughput in the vertical retorts has also been studied. In all, three sizes of coal of each of three different coals (strongly, medium, and weakly caking) have been tested on the full-scale retorts, involving over 50 separate tests. There was some difficulty in ensuring that the quality of the coal was

not altered by the grading, as would be the case if run-of-mine coal was screened to the sizes required, and, in the case of the horizontal retorts, of ensuring that the results were not affected by variation in the space occupied in the retort. It is thought that these difficulties have been satisfactorily overcome. The results of the tests are now being studied, and a full report is being prepared for publication.

It is noticeable that high yields of tar (amounting in one case to nearly 20 gallons per ton of coal) were obtained in the vertical retorts when using weakly or medium caking coal with no fines, whereas the highest tar yield from the horizontal retorts was about 14 gallons per ton.

HYDROGENATION OF COAL.

Work on the hydrogenation of coal has continued throughout the year at the Fuel Research Station, with both the small bombs and the intermediate scale continuously-working plant. This work has, in the main, been directed to an investigation into the fundamental aspects of the process, rather than to the development of a commercial plant. It has been found that by a less drastic process than is necessary for the liquefaction of the coal, a " partial hydrogenation " takes place which greatly increases the caking properties of a caking coal or confers them on a non-caking coal. Cellulose, oak sawdust, peat, and a number of coals, including anthracite, have been treated; and the resulting material in every case will yield a coherent coke on carbonization. These investigations should throw light on the mechanism of coke formation, and may have important industrial applications. A number of patents, suggested by this work, have been applied for; but much further work is required before the commercial possibilities can be proved.

RESEARCH ON ILLUMINATION.

The effect of illumination on the ease of carrying out fine manipulative processes has been further studied by means of an investigation into the lighting required for weaving on Jacquard looms, and a report embodying the Committee's recommendations has been submitted to the Home Office. The desirability of an investigation into the lighting required for paper-making is under consideration.

Considerable further progress has been made with the research into the relation between glare and visibility in street lighting, undertaken for the Illumination Committee of the British Engineering Standards Association.

HOLBORN: ABOVE AND BELOW GROUND.

FIG. 1.

By the courtesy of Mr. W. J. Liberty, we are enabled to illustrate, from his lecture on " Underground London," a section of Holborn (not the devastated roads) showing the mains of the various Companies comfortably housed under the streets on brackets or on cradles on the floor of subways well ventilated, drained, well lighted, and with ample space for men to work around the joints and to walk freely about in these underground streets constructed previously to 1869. These

below-streets with their communication with houses en route have met all modern requirements as they have arisen. At first they were only used for gas and water mains; they are now utilized by the various Companies and Departments that have since come into being for hydraulic, electric light, and telephone work.

Fig. 1 shows a section of roadway with under-streets below

Fig. 2.

the footways of a principal thoroughfare with the "pneumatic dispatch tube" running down the centre of the roadway. Fig. 2 shows existing subways under footways at Holborn; and fig. 3 shows an underground street with gas and water mains under the roadway.

The pneumatic dispatch tube shown is the tube which has been mentioned in the course of the inquiry, though another section of it There have been several of such tubes laid down in London. In 1861 a tube was laid down in a field near the Battersea Railway Station. In 1864 the first pneumatic passenger car and tunnel was operated at Sydenham; a tunnel ¼ mile long and 10 ft. in diameter being built in the grounds of the Crystal Palace. It was suggested that a tube on this principle should be constructed under the Thames between Whitehall and the Elephant and Castle when the Victoria Embankment was being constructed.

The pneumatic dispatch tube which has been under survey by the Commission was built between 1864 and 1869 by a Company to run between Euston Station and Saint Martins-Le-Grand, with a station at Holborn. It had a diameter of 4 ft. 6 in., and was for parcels traffic. It was not watertight; the neighbourhood was full of springs; and it was difficult to keep it dry in spite of continuous pumping, so that it

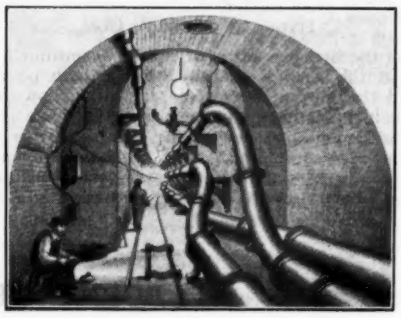


Fig. 3.

became practically water-logged in places. There was a very steep incline passing under old Holborn Hill, where it crossed over the crown of the old Holborn Bridge, which still spans the Fleet. The tube was installed before its time and was unprofitable; and before the G.P.O. commenced their parcel post the amount of traffic on it was negligible, though it was capable of carrying much in excess of the demands of those days. It was abandoned, and for over 40 years lay derelict, going into the hands of a prominent firm of liquidators. The Company was kept alive by the payment of the necessary fee to Somerset House. Finally the tube was purchased by the G.P.O. at a knock-out price to enable them to lay their trunk telephone cables through Holborn.

THE TREATMENT OF COAL.

Second Cantor Lecture delivered by Dr. C. H. Lander, Director of Fuel Research, Department of Scientific and Industrial Research, on Jan. 28.

In the second Cantor Lecture given at the Royal Society of Arts on Jan. 28, Dr. Lander dealt briefly with some of the more recent work carried out on the constitution of coal. He pointed out that only comparatively recently had the work of different experimenters tended to converge, and produce results of tangible importance. In problems associated with the burning of coal in the raw state the simpler forms of physical and chemical investigation gave adequate information; but where such complex processes as carbonization or hydrogenation were concerned, a more exhaustive and intimate knowledge of the coal substance was desirable.

Bone had interpreted his researches on the extraction of coal by various organic solvents as showing that a group of nitrogenous "humic" bodies, varying in quantity according to the nature of the coal, could be extracted by benzene under pressure, and he considered that these bodies were mainly responsible for the coking propensities of coking coals. He pointed out that the residues left after the completion of the extraction were non-caking, and he concluded that the bodies extracted by benzene were pre-existent in the original coal complex, and were not derived from it by chemical decomposition.

Wheeler and Francis had developed a method of studying coal composition, which they termed "rational analysis." A rational analysis of any coal could be given in terms of the proportions of free hydrocarbons and resinous compounds, organized plant entities, and ulmins. The hydrocarbons and resins were grouped together, and were believed to form the oil yielding constituents, and, at the same time, to be in some degree responsible for the caking properties.

The Decomposition Point of Coal.

Some confusion existed regarding the interpretation of the term "decomposition point" of coal. The recent work of King and Willgress had been followed by more detailed investigations by Cockram and Wheeler. It was quite clear that it was necessary to distinguish between products distilled from the coal without change, and those resulting from the decomposition, however slight, of organic matter.

Dr. Lander mentioned the importance of assay methods in their bearing on carbonization. The Gray-King method was used at the Fuel Research Station, and had given valuable results, which could be interpreted in terms of large scale working. Other investigators used other methods, perhaps equally good, but the time was more than ripe when some agreement and possible compromise should be arrived at.

High-Temperature Carbonization.

High-temperature carbonization formed the basis of two large and important industries, the technique of which had been the subject of experiment for something like 100 years. In industries such as these, technical improvement was not likely to follow any revolutionary change or discovery, but rather to result from the painstaking labours of the men in charge in applying up-to-date knowledge to their own local conditions. The results of such improvements might not be measurable individually on any very considerable scale, but their aggregate effects represented enormous economy.

The function of the gas industry was to provide a centralized supply of gas at the lowest possible cost to the consumer. The aim of the coking industry, on the other hand, was to produce coke of a type which should make the over-all operations of the iron and steel trade profitable.

Dealing with some points of high-temperature carbonization as affecting the gas industry, the lecturer pointed out that it was not always recognized by the critics of this industry that the cost of gas into the holder was only a small fraction of its average cost to the consumer. Other important items of cost were (1) distribution, (2) maintenance of fittings, and (3) management.

A gas company was both a wholesaler and a retailer, and its customers consisted of practically every householder in its own area, most of whom took gas in small quantities. On this account distribution and management charges must be high.

Anything that could be done in manufacture to reduce the cost of (1), (2), or (3), such as (*a*) reduction of specific gravity, (*b*) increase of calorific value, (*c*) removal of water, (*d*) freedom from naphthalene deposits, or (*e*) reduction of organic sulphur compounds, &c., would reduce charges other than direct cost of production, and it was sound to introduce more expensive processes if their additional cost could be more than saved in distribution, &c.

A revolution in the gas industry had taken place during the last 25 years through the change in the consumer's requirements from illuminating value to heating value.

Before the inception of the Gas Regulation Act, experimental work by the industry and the Fuel Research Board had shown clearly that, within certain limits, the consumer's requirements both for high and low temperature production, such, for instance, on the one hand, as the heating of incandescent mantles, or, on the other hand, the carrying-out of boiling or cooking operations, could be served equally well by low as by high calorific value gas, provided the same total quantity of heat were delivered in both cases. This had led to the introduction of the thermal method of charging for gas. Some of the reduction which had taken place in the price of gas since the application of the Act was undoubtedly due to the measure of freedom it gave the gas manager to adapt his operations to his own local conditions, taking into account all the factors which affected cost, both in the retort house and in the distribution system.

DEVELOPMENT OF THE CONTINUOUS VERTICAL RETORT.

Another gradual change during the past 20 years was due to the development of continuous vertical retorts, which now produced about half the total gas made. The advantages of vertical retorts were (1) less ground space than horizontals, (2) less labour costs per therm, (3) lower fuel consumption, and (4) production of dryer coke. On the other hand, they were more susceptible to variations in the type and quality of the coal. They worked best with nut coal, and would not deal satisfactorily with some fine slacks, while horizontal retorts would take any coking coal of any size, and give satisfaction.

From the point of view of gas production and coke quality, blending was of more advantage in horizontals than verticals. Verticals required a higher grade of intelligent control, but, since this already existed in most works, it could not fairly be counted a disability.

The relative advantages of low-grade and high-grade gas had, in the past, been the subject of bitter controversy. It was possible that low-grade gas could be produced by complete gasification at a lower cost per therm, but its true position in relation to high-grade gas must in every case be based also upon close analysis of its effects upon distribution and storage charges. Low calorific value gas involved the delivery of increased volumes, and, since its specific gravity was also higher, these two factors were united in influencing such factors as size and cost of mains, distribution pressures, size and cost of meters, and service appliances, &c.

Dr. Lander remarked upon some other points affecting the gas industry which he ventured to think were not always thoroughly appreciated. For instance, very little scrubbing for benzole had been practised since the war, the line of argument being that, with gas at (say) 10d. a therm, the value of the heat content of the benzole, if allowed to remain in the gas, was the equivalent of 1s. 3d. per gallon. If the cost of extraction were 7d., and the cost of distribution 6d. a gallon, then the cost of gas-works benzole without any profit into the consumer's car would be 2s. 4d. per gallon. Though admittedly it would in any case be difficult to compete with petrol at its present price, he doubted whether such arguments were altogether sound. It must be remembered that since the gas supply had to be maintained, benzole extraction would entail an increase in the amount of coal which had to be carbonized, and, taking everything into consideration, the cost of liquid benzole to the gas company might be considerably less than the figure assigned to it on the above assumptions. Further, increased extraction of benzole in gas-works would be a great national advantage through tending to reduce the amount of motor spirit imported.

HEATING RETORTS.

The question of heating retorts was worthy of consideration in some detail. By adopting in suitable cases a centralized supply of clean producer gas, the saving in retort repairs, the better control secured, &c., might more than pay for the loss of heat involved in not delivering hot gas direct from the producers. Another advantage would be the possibility of delivering the heating gas under pressure, so that outleakage of coal gas might be obviated. Experience obtained in this direction in the horizontal retorts at the Fuel Research Station showed that, after 893 days of working at 1350° C., the state of the combustion chambers was as new, and the retorts themselves, though cracked and in need of repair, exhibited no sign of overheating. The station had been complimented by many experienced workers on the state of the combustion chambers, and the method was being tried in at least one large gas-works.

The question of heating the retorts by a proportion of their own gas during off peak conditions was touched upon. This was frequently done at the Fuel Research Station, and no difficulty was experienced provided proper precautions were taken in burning in the combustion chambers a mixture of 50 p.ct. coal gas and 50 p.ct. fuel gas made from coke. Similar experiments were being carried out by the industry, and, by the use of modified burning appliances, it was possible that 100 p.ct. coal gas might be utilized.

On the coke side, the necessity was pointed out of supplying gas coke as dry and clean as possible. Dry coke could be obtained by greater attention to quenching, but clean coke could be made only from clean coal. If there were a greater demand for washed or cleaned coal, it was possible that the collieries might be able to supply it at a lower price than they had to charge at present.

CLEAN RAW MATERIAL.

Dr. Lander said that he could not stress too strongly the question of cleanness of the raw material if a fuel were to be made for household purposes, whether by gas-works, coke ovens, or low-temperature processes. It was a curious fact, though one quite capable of explanation, that 7 p.ct. of ash in a coal burned in the raw state in a household appliance was much less obvious and less of a nuisance to the householder than was 7 p.ct. of ash in a coke of any kind.

Some of the considerations mentioned were equally applicable to coke oven practice, but it was emphasized that, at any rate at the present time, the major output of the coke ovens was used for blast furnace purposes.

Blending was of great importance in this connection, and was rapidly becoming an essential control factor on the Continent. Some attention had been paid there to blending with low-temperature coke, and reductions had been made in the carbonizing time by its use. On the Saar it had been tried in order to obviate the necessity of bringing from a distance a supply of non-caking coal for blending, so as to produce the finest quality of coke.

Dr. Lander stressed the necessity of installing an experimental large-scale coke oven plant in this country, so that the effect of changes in working could be accurately studied. The present method of relying on "bag" tests was uncertain, and frequently led to misleading results. He also deplored the tendency in this country for industry to look at the aggregate cost of the research work which it undertook, losing sight of its cost relative to the large interests involved.

He thought that the appointment by the Board of Trade of a Committee to consider the possibilities of closer co-operation between gas-works and coke ovens in a certain defined area was a step which would clear up many uncertainties and controversies.

The lecturer paid a tribute to the close attention to the work of the Fuel Research Station which was being given by many firms, but said they would welcome an even closer *liaison* with the fuel utilizing industries.

VOTE OF THANKS.

The CHAIRMAN (Dr. R. Lessing), proposing a vote of thanks to Dr. Lander, emphasized the need for a more liberal financing of research by industry. After all, he asked, what was a paltry £50,000 for a set of coke ovens, if, as the result of its installation, the saving of very much larger sums were to be effected?

THE CITY OF BIRMINGHAM HANDBOOK.

In connection with the forthcoming British Industries Fair at Castle Bromwich, Birmingham, the Corporation of this City has prepared for distribution among visitors "The City of Birmingham Handbook, 1928-1929."

In a foreword to the publication, the Lord Mayor, Councillor Byng Kenrick, says that a year ago his predecessor wrote a few words of introduction for a volume entitled "Birmingham and Its Civic Managers," and the welcome given to this interesting account of the government of the city encouraged the production of the present volume. This official Handbook gives a general view of the municipal affairs, and traces the evolution of civic administration from obscure beginnings up to the vast and complex system which exists to-day. The object of the publication is to provide an accurate source of information for visitors to the British Industries Fair, and to enlighten inquirers concerning the facilities for trade and industry which the city offers. Within the pages of the book will be found an epitome of that rapid development of local government which has been a distinguishing feature of the domestic history of England during the last hundred years.

It is stated in the introduction that the secondary consideration that has led to the publication of this book is the need for manufacturers to become acquainted with the Corporation's activities—not only those activities immediately affecting their industrial welfare, but also those which contribute to the efficiency and physical fitness of the worker. The Handbook is not intended to be a work of reference; and if figures occasionally insinuate themselves, it is to be hoped that their presence will not detract from the idea that the book is to be read, and not placed on a high shelf amid a litter of publications more distinguished by verbose abstruseness than live interest.

There is included a comprehensive article on the progress of gas in Birmingham, excellently illustrated by photographs of plant and works of the city's undertaking. Birmingham is particularly noteworthy for its industrial users of gas, and it is stated that during the last 18 years the consumption for this purpose has increased by approximately 2,454,718,900 c.ft.

TRAINING IN FUEL TECHNOLOGY.

NEW COURSE OF ADVANCED STUDY AT THE SIR JOHN CASS INSTITUTE.

From an Inaugural Address by Dr. F. S. Sinnatt, M.B.E., Assistant Director of Fuel Research, Department of Scientific and Industrial Research, on Jan. 28.

This evening marks the opening of a new centre at which advanced knowledge upon the subject of coal and carbonization can be obtained. A course of lectures delivered by Mr. H. D. Greenwood will be devoted to a study of the scientific problems of coal and coal carbonization. The subject will be under the direction of Dr. de Barry Barnett, and it has been accepted by the University of London as a course by which students who have graduated may proceed to sit for an examination, and offer a thesis with a view to obtaining a higher degree. Students will have the opportunity of hearing lectures upon the most recent scientific and technical work on coal and coal carbonization, and thus acquire that scientific knowledge of the subject which will enable them to think more deeply and profitably about the work they are doing during the day. It is sometimes forgotten that one cannot apply what one has not got, and a man who has graduated in science has much to learn before he can call himself a Fuel Technologist; and not the least of his difficulties is to keep himself ahead of the times, and know what is happening in other branches of his subject.

THE VALUE OF THE COURSE.

The literature of coal and the allied industries has become so great that a course such as the present one is of immense service to students of all types, and is a refresher course for the trained Fuel Technologist. The general chemical student should ponder before neglecting the opportunity of hearing the lectures, for no matter what branch of chemical technology he enters later, heat or power will be its basis, and the properties of coal or products obtained from it will enter into his daily life. I would also suggest that engineering students could also look forward to taking some such course.

The Sir John Cass Institute has always had an intimate association with fuel, and provides courses on petroleum, gas engineering, and gas analysis, and there is also a department on metallurgy and refractory subjects, with which fuel is intimately connected. Those responsible for the Sir John Cass Institute recognize that a need exists in the country for a greater number of centres of advanced learning at which students may gain a deeper insight into the basic properties of coal—the nation's main natural asset. Already ten graduates in science have offered themselves, and been accepted by London University, as being qualified to proceed with the course. These graduates are occupied in the day time mainly in some branch of Fuel Technology, and attendance at the course of lectures and the discussions which follow, combined with the preparation of a thesis on selected problems, will give an added inspiration and insight into questions encountered in the course of their professional duties.

The lectures are all the more necessary when the position of the carbonization industry in the London area is reviewed in relation to the gas industry of the whole of the country. It is sometimes thought that London is not a suitable centre for the study of coal technology, as it is somewhat removed from industrial operations; but this does not apply in the case of coal carbonization. The London area is the largest centre of coal carbonization for the production of coal gas, and, out of a total consumption of 17 million tons of coal by the whole gas industry of Great Britain in the year 1927, a total of 5,600,000 tons were treated in the gas-works in the London area, and of this 4,600,000 tons were carbonized by three gas companies. The need for fuel technologists is governed essentially by the commercial requirements of the industry, and, if the number engaged on the carbonization of coal is placed on a tonnage basis or on gas therms produced, one-third of the fuel technologists employed in the gas industry in Great Britain should be in the London area. The second large industry—viz., the coking industry—is obviously intimately associated with the production of iron, and the plant is generally situated close to the blast furnaces and other metallurgical operations. This industry carbonizes about 14 million tons per annum. In addition, however, to being the largest user of coal for coal gas manufacture, London is also the most important market for coal for domestic purposes, and this introduces another aspect of carbonization—viz., the enormous potential market there exists for all types of substitutes for coal, such as low-temperature coke. If, therefore, low-temperature carbonization continues to develop, many of the plants will aim to satisfy the domestic market, and, at the present moment, plants on a number of different systems of low-temperature carbonization are being erected in the neighbourhood of London to supply low-temperature coke. This movement will increase the demand for technologists well informed on coal and coal carbonization.

THE EDUCATIONAL SYSTEM.

It may be of interest if I examine briefly the educational system in the country to discover where and how a student may obtain instruction in the technology of fuel. Fuel Technology is a full-blooded science, any one branch of which will fully occupy a man's whole life. I do not propose to consider the science of coal mining as a branch of Fuel Technology. Until a few years ago the student of Fuel Technology was largely concerned with the study of the manufacture of coal gas, and the production of power; but within recent years coke manufacture, pulverized fuel, low-temperature carbonization, and hydrogenation have become of increasing moment. The gas industry has always recognized the necessity for systematic instruction in gas engineering and gas supply, and as a result two educational organizations are in being for gas manufacture. The first of these is the Department of Coal Gas and Fuel Industries, established in 1907 at Leeds University. The Livesey Professorship was endowed by a fund raised by the Institution of Gas Engineers, and the present occupant of the Chair is Prof. J. W. Cobb. Students may read for degrees in Gas Engineering, and Fuel and Metallurgy, and proceed to high degrees.

The second educational organization is the Education Scheme of the Institution of Gas Engineers in co-operation with the various Government Departments of Education (the Board of Education, England and Wales; the Scottish Education Department, &c.), in which carefully arranged part-time courses of instruction in the manufacture of coal gas, both from an engineering and chemical standpoint, and gas supply, have been organized at most educational centres in the country.

There are two further Professors of Fuel Technology in Great Britain—Prof. W. A. Bone, of the Department of Chemical Technology at the Imperial College of Science and Technology; and Prof. R. V. Wheeler at Sheffield University. Prof. T. Gray has for many years delivered important courses of lectures on fuel at the Royal Technical College, Glasgow, but, as far as I know, no separate Professorship or Lectureship in Fuel exists there. Associated with each Chair of Fuel there is, as a rule, one Lecturer in Fuel. In addition to the above, Mr. A. McCulloch is the Lecturer in Fuel at Manchester University, and Dr. Whitaker is Lecturer at University College, Nottingham. So that, altogether, there are six places of University rank where Fuel Technology is a full subject in the University curriculum; and since there are well over twenty Universities or University Colleges in Great Britain, it is clear that the attention paid to the subject of fuel is so inadequate as to be a serious reflection upon our Universities.

THE INADEQUACY OF PRESENT TRAINING.

The inadequacy of the centres of learning is reflected in the shortage of properly qualified young men to fill posts in industry and in research organizations. At present, the only method of obtaining assistants is to appoint men with an adequate training in Chemistry or Engineering, and trust to their picking up the subject of fuel by the way. Such are obviously incompletely trained, since they have not received instruction in the fundamentals so important in Fuel Technology.

HYDROGENATION OF COAL.

Speaking of recent work at the Fuel Research Station, Dr. Sinnatt remarked: We have been experimenting as to what happens to the coal substance when it is fractionally hydrogenated. We have found that when coal is treated with hydrogen under pressure and at elevated temperatures, a product can be obtained possessing higher caking properties than the original coal, though the amount of hydrogen taking part in the reaction may be very small. Non-caking coals have been subjected to this treatment, and have yielded a product possessing caking properties equal to, if not greater than, that of well-known caking seams. It would, therefore, appear that caking properties may be conferred on a seam by artificial means.

Bussey Coal Distillation Company.—It has been announced that progress in the erection of this Company's plant at Glenboig is so far advanced that the works will be in full operation by June 1 next. The Glenboig plant, which will have a throughput of 500 to 600 tons of coal a day, will have a daily output, when working at capacity, of approximately 300 tons of smokeless fuel, 15,000 galls. of crude oil, and 15,000,000 c.ft. of gas.

IMPRESSIONS OF GAS-WORKS IN CANADA, THE UNITED STATES, AND GERMANY.

From a Paper by C. F. Broadhead, of Melbourne, before the Australian Gas Institute on Nov. 20, 1928.

Vancouver.

Annual make	800 million c.ft.
Calorific value	450 B.Th.U.
Percentage water gas added	25

The carbonizing plant consists chiefly of Glover-West verticals. These had been working seven years, and were still in fair condition. During the winter steam is taken 700 yards from the waste-heat boilers at the works to the office, for heating purposes. The average analysis of coal used was 18 p.ct. ash, 32 p.ct. volatile, and 50 p.ct. fixed carbon. Price, 19s. per ton, f.o.b. The basic wage was 1s. 10½d. per hour, and vertical operators received 2s. 8½d. per hour. No union exists, nor do strikes occur; the men being on the best of terms with the management. On the distribution side a leading feature is domestic heating by hot air and hot water during winter; gas being sold for heating at 3s., and for cooking at 5s. per 1000 c.ft.

The gas and electricity undertakings are owned by the same Company; consumers being given their choice of commodity. The rate of increased gas consumption has been probably a record for the British Empire.

Toronto.

Annual make	3838 million c.ft.
Calorific value	500 B.Th.U.
Percentage water gas added	45

There are two works at Toronto, the more recent being admirably laid out on an extensive site with room for all future requirements. The manufacturing plant consists mainly of Glover-West vertical retorts, and water gas plant. The whole of the plant is under cover and housed in brick buildings, owing to severe winters. There is little to be said regarding the plant generally, other than that it is up-to-date and in exceedingly good order. All gas enters the purifier at the top, and leaves at the bottom; the reason being that the first layer fouls very quickly, and the top layer only can be easily changed. To get at the bottom layer would necessitate the removal of the whole of the oxide.

A 4-million c.ft. waterless holder has been erected. The reason for this decision was that 20 p.ct. more holder capacity could be obtained for the same money. I was struck by the comparatively simple nature of the foundation work.

"Connersville" station meters are in use. The Engineer considers them extremely satisfactory, and would not care to revert to water station meters.

Differential rates, according to the quantity used per month, are in force. The first 10,000 c.ft. is charged at 10 cents gross per 100 c.ft., 8½ cents net; next 90,000, 9½ cents gross, 8 net; over 100,000, 9 cents gross, 7½ net. Service charge, 50 cents per month.

Denver.

Make per annum	3300 million c.ft.
Calorific value	335 B.Th.U.
Percentage water gas	75

At the time of my visit, in August, 1927, the city (75,000 consumers) was being supplied with a mixture of 75 p.ct. water gas and 25 p.ct. coal gas, of a nominal calorific value of 400 B.Th.U.; the standard having been reduced from 600 B.Th.U. in a few years.

Many unusual features were in evidence at Denver. Stop-end hand-charged horizontal retorts were working in conjunction with the most modern blue and carburetted water gas plant. As an alternative to the steam drive on the exhausters, an electric drive has been added by cutting teeth in the flywheel and using a pinion direct. Doherty washer coolers are in use with cold water sprays. The purification plant consisted of a Koppers 12 million per diem liquid purification set, and a number of catch boxes having deep layers of oxide. This combination was stated to work well and give no trouble. The water gas relief holder connections having become too small through increased make, a 30-in. connection to the crown of the holder has been added, which rises and falls with the holder, working in a water-sealed outlet at the tank level.

The maximum output per diem has reached 14 million c.ft., though the total holder storage capacity is only 3½ millions. The works holder has a capacity of three-quarters of a million, and there are five district holders, each of a capacity of half-a-million. The latter are situated in residential suburbs, and have been surrounded by trees, lawns, and flower beds, exceedingly well laid out and kept.

Of the 75,000 consumers, approximately 50,000 had high-pressure services with governors; the mains pressure being 5 lbs., and consumers' pressure 4 in. to 6 in. water.

Though the actual calorific value of the Denver gas was about 335 B.Th.U. at the time of my visit, there was little complaint regarding the quality. I inspected the cooking installations at the Brown Palace and Cosmopolitan Hotels—the latter said to be the finest kitchen of its size in existence; the apparatus having cost over £5000. The pressure at the cooking point was 4 in., producing an intensely hot flame, and, according to the chef, giving entire satisfaction.

At the time of my visit a proposal to carry natural gas a distance of 350 miles was being discussed. On June 23, 1928, natural gas was first turned into Denver, and six weeks later every gas appliance in the city was adjusted to natural gas with a calorific of 1075 B.Th.U. In the case of hotels, bakeries, and newspaper and other commercial concerns, the adjustment was made in one day (Sunday).

The domestic rate in Denver is as follows:

		s.	d.	
First	400 c.ft. or less	3	9	
Next	600 ,,	0	7½	per 100 c.ft.
,,	1000 ,,	0	6	,, ,,
,,	1000 ,,	0	3½	,, ,,
,,	7000 ,,	0	3	,, ,,
,,	10,000 ,,	0	2½	,, ,,

The average is 2s. 8·375d. per 1000 c.ft. for 20,000 c.ft.

Since turning natural gas into the City of Denver, the gas sales have been reduced one-half, though the calorific had practically trebled.

Chicago.

People's Gaslight Company.

	Million C.Ft.	
Water gas produced	13,972	37 p.ct.
Coal gas produced	8,666	63 p.ct.
Coal gas purchased	14,696	
Total	37,334	
Calorific value	540 B.Th.U.	
Minimum daily output	137 million c.ft.	
Maximum daily output	66 ,, ,,	

I inspected the largest works, which are run by the Chicago By-Products Company. The plant consists of Koppers coke ovens and Western Gas Construction Company carburetted water gas plant. The maximum output of this works has been over 70 million c.ft. per day, and consisted of 45 million c.ft. of carburetted water gas and 25 million c.ft. of coke oven gas. The make per ton in the coke oven plant is 11,140 c.ft. of 570 B.Th.U. gas, the production of tar 8·7 gallons, and of ammonia 23·64 lbs.

The water gas plant consists of nine 11-ft. sets with Wickes waste-heat boilers. The latest set is fitted with a self-clinkering grate, which consists of a revolving scraper above the fire bars. This was stated to be a most promising development, having run continuously for thirty-one days without clinker trouble.

The coke ovens are heated by gas made in large self-clinkering producers. They accumulate a large quantity of carbon in the top portion, and are cleared (or scurfed) by means of compressed air attached to the discharger, which burns off the carbon after each discharge on leaving the retort.

The total holder storage capacity is 79 million c.ft., including two 10-million holders at the Chicago By-Products Company's works, and a 15-million waterless holder in the district. No general trouble has been experienced with the latter, but there is much vibration in the holder, probably due to pumping, and the tar circulated has to be heated in the winter time. The mileage of mains at Chicago is 3515. There is a 5 lbs. pressure 48-in. main ring round the district, which is reduced to 6 in. in the low-pressure mains by means of governors and district holders.

There are practically no high-pressure consumers other than industrial users. The compressor on the district at the works consists of a 2700 H.P. Westinghouse set coupled to an Ingersoll-Rand compressor capable of sending out 90 million c.ft. per day at 6½ lbs. pressure.

The People's Gas Light and Coke Company, of Chicago, buy gas on the basis of records from eight "Connersville" meters having a total normal rating of 125 million c.ft. per day. The total inerts sent out average 15 p.ct., and there has been no increased internal corrosion of service pipes, though steel tube is used.

The analysis of gas sales for 1926 is as follows:

	P.Ct.
Domestic	65·07
Commercial	17·38
Industrial	14·20
House heating	3·00
Street lighting	0·35

New York.

Consolidated Gas Company.

Gas made, carburetted water gas	39,112 million c.ft.
Coal gas	7,654 ,, ,,
Total	46,776
Calorific value	547 B.Th.U.
Water gas	84 p.ct.

I paid a visit to the new Hunts Point Station, where all the gas produced is made in large Becker coke ovens. Excessive naphthalene trouble is experienced in the condensers owing, in my opinion, to the free space at the top of the oven. There is also a large production of scurf at the top of the oven.

The exhausters were of the "Connersville" positive impeller type. After the exhausters there was a lay-out of secondary cooler scrubbers. The cooling was done by coils, and also by direct city water spray. After this secondary cooler was a Feld washer for naphthalene elimination; the naphthalene content being restricted by law to three grains per 100 c.ft.

The purifiers consisted of the ordinary type of box, containing two layers of coarse "Lux" material each 5 ft. deep, with reversible flow connections. No box had been changed for nine months, and it was expected to foul the oxide before changing it.

There is a 15-million waterless holder at this station. Only minor troubles with the tar pumps have been experienced; the piston is very finely adjusted, and the disc is said to be not more than 1 in. out in 280 ft. diameter.

Berlin.

Municipal Works.

Annual make	16,210 million c.ft.
Calorific value	488 B.Th.U.

Gasbetriebsgesellschaft Works.

Annual make	8403 million c.ft.
Calorific value	472 B.Th.U.

Danzigerstrasse Works (Municipal).

The daily output of gas from these works is about 7 million c.ft. The gas is manufactured in vertical and horizontal ovens. The horizontal ovens (Koppers) consist of a battery of forty chambers, carbonizing five tons of coal in twenty-four hours. The chambers, which are 20 ft. long and 16 in. wide, are heated from a central producer plant; the temperature in the flues being 1250° to 1300° C. The coal is well burnt off. German coal (mostly Ruhr) is used, and the results were given as follows:

Gas made per ton	13,000 c.ft.
Calorific value	535 B.Th.U.
Therms	69
Inerts	13 p.ct.
Tar made per ton	9 galls.
Ammonia per ton	37 galls., 8 oz. liquor.

Water gas is mixed at the outlet of the retort houses.

The cost of purification is low, being 0·4d. per 1000 c.ft.

Practically all street lighting is done by high-pressure gas, with excellent effect.

Mariendorf Works (Company).

All the plant at these works is housed in brick buildings. There is also a large amount of ground space available, which is at present laid out in lawns and well planted with trees. One of the most interesting features of the works is the system (introduced by the Chief Chemist) of each section having a standard routine carried out by a trained foreman, thus obviating the employment of qualified chemists. The organization appears to run smoothly. It was stated that, since the war, labour had been reduced 50 p.ct. This may be due to economic causes, for the sales of gas have been decreasing seriously in this part of Berlin.

The coal is carbonized in Dessau intermittent vertical retorts, each setting having eighteen retorts. Retorts of both fireclay and silica are in use; and it is stated that under the same carbonizing conditions no appreciable difference in results have been observed between the two types of plant. At relatively low flue temperatures of 900° and 1300° C. the life of the fireclay retorts was 3500 to 4500 days.

The following results were given as representative of average working with German coal (Ruhr):

12-HOUR CHARGES.

Gas made per ton	12,500 c.ft.
Calorific value	535 B.Th.U.
Therms	65·8

16-HOUR CHARGES.

Gas made per ton	15,400 c.ft.
Calorific value	485 B.Th.U.
Therms	74·7

Steaming is introduced after the tenth hour.

Blue water gas is made in a separate plant; 25 p.ct. being added to bring the gas supplied down to 440 B.Th.U.

Purification.—The only point of interest in the wet purification system is the calibration of the valve spindles on all the plant. The spindles are fitted with a scale showing the volume of gas passing when the valve is open to varying depths; and correcting factors are supplied for different pressures. The differential pressure over the valve is measured by means of a Seger gauge capable of being read to 1/100th in. One is impressed with the time and care which have been spent in calibrating the valves on the different units of the plant, and with the fact that very little appears to be left to the old rule-of-thumb method.

The dry purification system is operated on the divided flow system. There are three streams of gas to the purifiers, each with four primary boxes and two secondary boxes, every box containing four layers of "Lux" mass.

These works are equipped with a large chemical laboratory. Few routine tests are made, but important investigation work has been carried out by Dr. Geipert himself, notably on coal and coke testing. [In the "JOURNAL" for Nov. 21, 1928, was published an account of Dr. Geipert's laboratory method of assaying the gaseous yield of gas coals.]

Schoneberg Works (Company).

At these works Dessau intermittent vertical chambers have been introduced, and have been in satisfactory operation for about two years. The design of the setting is identical in general with the Dessau retorts. In the 5-ton chamber, however, a supporting wall is built across the middle of the chamber.

The charge of 5 tons is heated for twenty-four hours, thus requiring only one shift to operate the plant.

The results from this plant, with a mixture of Durham and Silesian coal, are as follows:

Gas made per ton	18,600 c.ft. with benzole extraction
Gas made per ton	20,800 c.ft. without benzole extraction
Calorific value	446 B.Th.U.
Therms	83 with benzole extraction
Therms	92 without benzole extraction
Fuel consumption	15–17 p.ct. gross coke

The coke is not screened for the producers in this installation.

The nitrogen content of the gas at these works is only 6 to 7 p.ct. The carbonizing temperatures are higher here than at the other works visited, being 1300°-1350° C.

The coke is discharged by gravity from the ovens into a wagon capable of holding the complete charge. This wagon, when filled, is run under water sprays at the end of the retort house, the steam being taken away by a shaft 30 ft. high. After quenching, it was observed that the upper portion of the coke was overquenched, but it appeared to be the practice to leave the coke in the wagon for a short time to allow the excess moisture in the upper layers to be evaporated by the hot coke underneath. It was stated that the average moisture content was 7 to 8 p.ct.

Mannheim Works.

Annual make	1342 million c.ft.
Calorific value	521 B.Th.U. gross

The Mannheim Works, probably the most interesting, from the carbonizing point of view, of all the works visited, consists of installations of Dessau intermittent vertical chambers. Otto Pintsch intermittent vertical chambers, and Koppers continuous vertical chambers. Each installation is independent of the others, and, therefore, can be compared for carbonizing results.

The Otto Pintsch chambers seem to be practically the same as the Dessau chambers; the main difference being in the method of heating. Both the Dessau chambers and the Otto Pintsch chambers are heated through five superimposed horizontal chambers. In the Dessau installation the combustion is regulated in the bottom combustion chamber only, whereas in the Otto Pintsch plant it is claimed that all five chambers can be individually controlled. At the time of my visit, however, only three were regulated. The nominal duration of the charge is 12 hours, but at present it is fixed at 14-15 hours. All installations at Mannheim are supplied by outside central mechanical producers built by Koppers, and at present burn screened peas.

The fuel consumption in the Otto Pintsch and Dessau installations is about 16 to 17 p.ct., whereas it is claimed that a recent test on the Koppers plant showed 10 p.ct.

The main external difference between the Dessau and Otto Pintsch systems is in the offtake pipes and bottom fittings. The offtake pipes on the latter system are very large. The Otto Pintsch, being a more modern installation, has also much better insulation.

The make of gas in the Dessau and Otto Pintsch systems is from 17,000 to 18,000 c.ft. per ton, against 18,000 to 19,000 c.ft. in the Koppers plant, both working on the same mixture of coal—about 75 p.ct. German Ruhr or Westphalian coal, and 25 p.ct. English coal. The calorific value is about 480 B.Th.U., thus giving a thermal yield of 85 on the Otto Pintsch system and 89 on the Koppers plant.

The Koppers continuous vertical chambers have a throughput of 10 tons per diem. The Works Engineer stated that no trouble had been experienced with "hanging up" or with the extractor since the plant had been put into operation.

There is no doubt whatever that excellent results are obtained from the different German carbonizing systems, which create a most favourable impression on a visit to that country. As no individual plant could be said to be distinctly superior to the best English plant, I consider the results are due to the following reasons:

More accurate control and management of carbonizing plant than is found in English or Australian works.

A harder-working type of labour, accustomed to organization, discipline, and strict personal control.

THERMAL INSULATION (WITH ESPECIAL REFERENCE TO DOMESTIC HOT WATER SUPPLY INSTALLATIONS).

By C. A. MASTERMAN, B.A., A.I.C. (of the Technical Staff of Watson House; Gas Light and Coke Company).

Paper before the London and Southern District Junior Gas Association on Jan. 25.

(*Concluded from p.* 353.)

The results on two hot water sets under various degrees of lagging are summarized in Table II. Set A is of higher capacity than Set B, but surface area per gallon is also higher. Careful analysis of these results shows a striking saving in gas to be obtained by quite a simple degree of lagging, amounting to anything between 10 p.ct. and 50 p.ct. on normal household usage. For application to existing installations the type of lagging most nearly fulfilling the various conditions required appears to be a hair felt, and a ½-in. thickness enclosed in a canvas jacket is provisionally adopted for the purpose. The covers are made up complete with the felt lining stitched into place. They are designed to be laced into position on boiler, storage tank, or pipe line, by means of stout cord. The felt is treated to repel insect attack, and both it and the canvas covering can be rendered fire resistant. Where protection of the whole installation is considered undesirable the covering of some part (*e.g.*, pipe lines only) will lead to considerable economy; examination of the results showing a mean saving of the order of 1 c.ft. of gas per hour per 4 sq. ft. of area, or 16 ft. run of pipe line covered. A finish of aluminium or other paint on the covers after they are in position will still further reduce the heat losses in a small degree, and facilitate cleaning if actual laundering is considered impractical. The covers may, however, easily be removed if desired.

As regards cost, if a routine of usage intermediate between examples (4) and (5) may be taken as typical, on a 20-gallon set the saving in gas will be about 65 c.ft. daily, which, with gas at 9d. per therm (c.v. 500), will represent about 6s. a month. This would meet the cost of the lagging long before the first year had expired. In studying the experimental results referred to, the correct balance between capacity of the set and the demands to be met is seen to be economically important. A set of excessive capacity will give a low overall thermal efficiency, while, if of inadequate capacity, it will deliver at inadequate temperature rise for maximum demand, though the overall thermal efficiency will be high. Estimates are based upon a set of a rated capacity corresponding roughly to the maximum total demand (normally) falling within any period equal to the time required to heat up from cold.

Clearly from the results obtained and on common sense grounds the greatest proportionate saving due to lagging will occur during periods when the water is hot and is maintained hot at a comparatively low gas rate. While the practice with an unlagged set is somewhat extravagant, when the set is lagged the gas may be kept continuously alight with the advantage of hot water being constantly available. The gas rate then corresponds roughly to the gas rate on the same set unlagged, run with the utmost care and economy, and lighted only exactly to fulfil demands. When gas is turned out in the interests of economy the heating surface in the boiler firebox becomes a cooling surface. Tests show that if air circulation through this space is then prevented the heat losses during the standby period are reduced by about 10 p.ct. on an unlagged and 25 p.ct. on a lagged set, the normal losses in this way naturally being slightly higher the greater the pull induced by the flue pipe equipment.

The expectation of being able as a result of these tests to derive a simple expression by which the saving in gas consequent upon lagging may be forecast has been mentioned. Analyses of a great mass of figures have led to this satisfactory result. The expression is founded on calculation, but is largely empirical, and appears for a reasonably normal usage and set to be accurate within about 5 p.ct. For the proposed degree of lagging, and assuming a reasonably normal usage and suitable set, the following expression gives the percentage of saving in gas consumption to be anticipated from lagging, or the percentage increase in overall efficiency.

[To make the usage before and after lagging correspond, it is the thermal equivalent of the water drawn rather than its volume which should remain the same, and this will be the usual domestic practice.]

$$\frac{100T\left(\frac{L}{4}+A\right)}{8W+CT}$$

Where T = Hours during the day the gas is alight.
L = Length of exposure flow, return or supply pipe to be lagged in ft.
A = Area of surface (other than pipe) to be lagged in sq. ft.
W = Total hot water to be drawn daily in gallons.
C = Capacity of set in gallons.

It may be asked why so involved a procedure has been necessary to arrive at so simple a result. Partly this has been due to an ambition to obtain a really representative expression covering a wide variety of installations and conditions. In part also it is due to the fact that direct tests upon many boilers are impossible. Unlagged boilers having aerated burners can only cut down to a certain limiting gas rate, below which they fire back or blow out. This limit will be above maintenance rate in the unlagged condition, but when lagged the maintenance rate is so much reduced that the burner cannot accommodate it. In these circumstances tests will merely result in continued heating up of the water until boiling point is approached, even though the thermostat has cut down.

In order to obtain a check on the expression quoted above, a felt and canvas duck jacket on the lines suggested was made for a hot-water set having a luminous burner. This could shut down if required to below the lagged maintenance rate. Two routines of usage were carried out, and the saving to be expected was calculated from the above expression for check against that actually found in test.

TABLE II.

Set and Condition.	1. To Heat.	2. To Maintain per Hour.	Gas Saving Over Unlagged. (Day's Run.) 3. Always Alight.	4. Alight Day Only.	5. Alight for Demand.	6. Heavier Service.	Gas Required to Heat up per 10,000 B.Th.U. in Final Water Content.	To Maintain at Maximum Temperature per Hour per 10,000 B.Th.U. in Water Content.
	C.Ft.	C.Ft.	P.Ct.	P.Ct.	P.Ct.	P.Ct.	C.Ft.	C.Ft.
Set A—Unlagged	61·0	8·8	..	..	..	..	28·0	4·0
,, Asbestos millboard ¼ in.	58·0	5·3	27	24	6½	22	26·4	2·4
,, ,, ,, ½ ,,	56·7	4·0	37	33	9	30	25·8	1·8
,, ,, ,, ¾ ,,	56·1	3·6	40	35	9½	32	25·5	1·6
,, ,, ,, 1 ,,	55·9	3·4	42	37	10	33½	25·4	1·5
,, Cellular asbestos 1 in.	55·0	2·8	47	41	11	37	25·0	1·3
,, Hair Felt ¼ in.	54·5	2·7	48	42½	11	38	24·7	1·2
,, ,, ,, 1 ,,	53·5	2·3	50	45	12	40	24·3	1·0
,, ,, ,, 2 ,,	53·0	2·2	51	45	12	40	24·1	1·0
,, Semi-lagged* H.F. 2 in.	58·0	2·3	48	40	6½	38	26·4	1·0
Set B—Unlagged	41·6	3·8	..	..	..	..	32·0	2·9
,, Asbestos cement 1 in.	37·8	2·6	17	15	8	12½	29·1	2·0
,, ,, ,, painted black	37·4	2·1	22	19	9	15	28·8	1·6
,, ,, ,, ,, aluminium	37·4	2·0	23	20	9	16	28·8	1·5
,, Hair Felt ½ in.	37·4	2·0	23	20	9	16	28·8	1·5
Mean of six different sets lagged during manufacture	..	..	..	..	..	..	27·5	1·3

*NOTE.—Semi-lagged represents set lagged throughout with the exception of the actual boiler.

Routine 1. Installation running well under full rated capacity; observed saving 13·7 p.ct.; calculated saving 16·7 p.ct.

Routine 2. Installation running slightly over full rated capacity; observed saving 30·8 p.ct.; calculated saving 30·5 p.ct.

(These results are probably too nearly in agreement to be typical.)

Lagging During Manufacture.

Attention has chiefly been concentrated upon the application of lagging to existing installations. In such cases the possibility of lagging to such a degree that the minimum gas rate is in excess of the maintenance rate has been mentioned. When boilers are designed originally to receive insulation, such a danger should not arise, since the heating may then be done by a luminous burner, or a special gas cut-out may be arranged to accommodate the great reduction in gas rate required. Whatever the means adopted for the cutting down of the gas when the required water temperature has been reached, it is desirable that full gas rate should be continued as far as possible up to this point. This abrupt thermostatic action has the advantage of diminishing the period necessary for heating up, and so lessening the capacity of set which will be required to accommodate a given demand.

GAS RATE DURING HEATING of LAGGED BOILERS

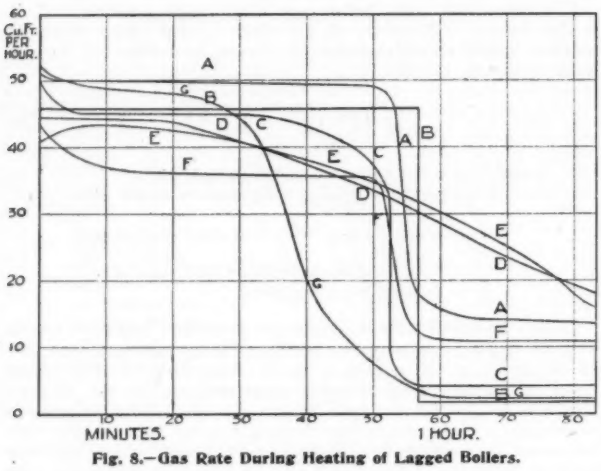


Fig. 8.—Gas Rate During Heating of Lagged Boilers.

Fig. 8 shows how the gas rate diminishes as the heating up progresses in a number of boilers, and the contrast in action of the different types of thermostat is very evident. On hot water sets lagged during manufacture a granular or fibrous material is generally used as a packing inside an outer sheet metal jacket. A high degree of insulation is easily achieved.

Sets lagged during manufacture will usually be self-contained units, and in many cases the boiler and storage are actually combined into one. In these circumstances the hot water tank is not available for warming an airing cupboard, but the deficiency may be made good by more convenient and more economical substitutes. The room in which the boiler set is placed will also require some other apparatus for warming it in cold weather, but there will often be no reason why this should not take the form of a radiator on the return between storage and boiler (when the latter is of adequate maximum gas consumption), so arranged that it may be short circuited when not required.

An interesting development which becomes possible under these conditions is a reduction in the maximum gas rate to an amount at which the provision of flue pipe equipment is unnecessary (*e.g.*, 10 c.ft. per hour). The gas is continuously alight, and if full gas rate is small the heating up period is proportionately increased. Hence, for the same demand as for a boiler of higher gas rate, the capacity must be greater. Abrupt thermostatic action is for the same reason desirable. When a heavy demand has been made on such a set it will be some hours before such a demand can again be met, but domestic routine can usually be arranged to accommodate this disadvantage. Avoidance of mixing between the cold inlet water and hot contents is, therefore, especially important in this type of set. Installation charges will be less than with an ordinary set owing to the low gas rate and lack of flue equipment, while the constant availability of hot water (subject to the above proviso regarding heavy demands) is an obvious convenience. The overall efficiency of such low consumption sets is not less than that obtained in the more familiar higher consumption lagged sets, and will normally be much higher than that obtainable with an unlagged installation. The whole of the heat losses contribute to the warming of the house.

Summary.

1. The merits of thermal insulation in respect of domestic hot water supply installations are only slowly being appreciated.
2. Thermal insulation is of two kinds: Lagging which reduces heat loss to the air and indirectly loss by radiation; and finish, which reduces the latter only. The effect of the latter, though appreciable, will normally be secondary.
3. The over-all efficiency of an unlagged hot water installation on household usage will normally be only between ⅓ and ⅔ of the nominal test efficiency. With a moderate degree of lagging this contrast between nominal and real efficiency is halved.
4. The gas saved in consequence of moderate lagging will never be less than 10 p.ct., and may exceed 50 p.ct.
5. A convenient and suitable form of lagging for application to existing installations is suggested in the use of ½-in. treated hair felt attached inside a canvas duck jacket arranged for lacing into position.
6. A simple mathematical expression is advanced for forecasting the gas saving to be anticipated from such lagging on any set and under any reasonable conditions of usage.
7. The cost of the application of lagging will soon be repaid by the saving in gas, usually within the first year after application.
8. Excessive lagging on a set not designed to receive it may in certain circumstances lead to overheating of the water, and excessive scale formation will result, even though boiling point is not actually reached. In such cases partial lagging may be used to reduce excessive heat losses.
9. Heat losses may also be reduced appreciably by preventing air flow through the firebox while gas is not alight, but adequate lagging allows gas economically to be alight the whole time, and results in the convenience of an ever available supply of hot water. (Overall efficiency will then roughly correspond to that on an unlagged set manipulated for demand with the utmost care and economy.)
10. The capacity of the set should be suitable for the demands to be made upon it. Maximum demand during any period corresponding to the time required to heat up from cold should not greatly exceed the rated capacity of the set; but, where mixing of the cold inlet water with the hot contents is successfully avoided, two-thirds of this capacity may give satisfactory service. Abrupt action of the thermostat will reduce the time required to heat up from cold, and will, therefore, enable a smaller capacity set to be used for the same demand.
11. An adequately lagged set may be efficiently run with a maximum gas rate so small that flue pipe equipment is unnecessary; the gas then being maintained alight continuously under thermostatic control.
12. Where lagged hot water installations are in use some provision must often be made for keeping the room warm in cold weather. An independent supply of heat for the airing cupboard may also be necessary. The conventional use of the hot water supply installation to fulfil these unrelated requirements can never be more than an inconvenient compromise.

The information and results summarized in this paper were originally compiled for the Gas Light and Coke Company, and I would like to conclude by thanking the Company for permission to bring them to your notice. I must also acknowledge the work done by my colleagues in the Company without which the prolonged trials involved could never have been accomplished.

Traffic and Road Vibration.—On Jan. 29 a paper read before the Institution of Civil Engineers by Mr. J. H. Hyde and Mr. H. R. Lintern, of the National Physical Laboratory, on "The Vibrations of Roads and Structures," was presented for further discussion. The authors have carried out experiments with recording instruments, which have enabled them to measure the amplitude and periodicity of the vibrations of the ground which are set up by such causes as the passage of heavy motor vehicles over definite obstacles and ordinary roads. The vibrations were found to vary in their transmission, according to the state of consolidation of the ground. It was established that the frequency of vibration of a road surface is greatly increased when the load carried places abnormal stress on the rubber tyre. When the wheel dropped into a pot-hole, especially when such a hole was preceded by a projection on the road surface, vibrations of considerable amplitude were set up.

WESTERN JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held at the Gas Office, Colston Street, Bristol, on Saturday, Feb. 2, when a paper was read by Mr. B. F. Harris, of Trowbridge, on "Policy in Distribution." The chair was taken by Mr. T. B. ARMITAGE, the President.

POLICY IN DISTRIBUTION.

By B. F. HARRIS, of the Trowbridge Gas Company.

Until the new era of legislation appears on the horizon we must ask ourselves how are we best to use the powers and means at our disposal to increase the use of our commodity, and, what is more important, to hold the business we have.

We can readily divide our output into two sections—industrial and domestic.

COOKERS.

No matter what ideas we may have had with regard to the supply of appliances of this nature, we cannot afford to take a short view in these days of keen competition, and hidebound rules must be relegated to the past if every household is to have gas cookery. Therefore we must encourage our consumers by giving facilities which will come within the reach of all—viz., simple hire, hire purchase, and direct sales.

SIMPLE HIRE.

In this connection a range of five cookers from a 13-in. oven with three hotplate burners to an 18-in. oven with five hotplate burners should suffice for any undertaking.

When adopting a series for hire, special attention should be paid to the relative patterns of rings and grill frets to ensure that the stock of renewal parts it will be necessary to carry is reduced to an absolute minimum. These components, generally speaking, have to bear the brunt of the consumer's demands, and, in consequence, bear the shortest life. There are numerous makes of very attractive appearance which are admirably suited for local standardization.

HIRE PURCHASE.

There are always a number of consumers who like to own appliances, but unfortunately, in some instances, have not the means at their immediate disposal to effect a cash sale. This being so we should allow them to purchase by agreed instalments spread over a term mutually arranged, but not exceeding three years.

CASH SALES.

The real business between the consumer and the undertaking begins at the time appliances have been installed in position. We can therefore afford to give liberal discounts for direct sales, and not think in terms of so much per cent. accruing to the results of our showroom and display enterprise.

WATER HEATING.

Many will agree that the policy of fitting gas coppers on simple hire is not a wise one owing to the shortness of life as compared with the more substantially constructed cooker. A liberal cash discount or a quarterly sum for a short period will make this item attractive to most householders. No matter whether the appliance be of tinned copper or rustless iron, a most important feature which appeals to the housewife is a wooden top, which facilitates the removal of clothes and their consequent draining without getting scalded in the process. Even if a house has a central heating system it is astonishing how many times a geyser would be an added advantage.

HEATING.

It is now becoming increasingly common to let gas fires on simple hire in the same manner as cookers, charging a rental only for the winter quarters—*i.e.*, from October to March, involving, of course, that while the fire may be used occasionally during the summer no rent will be charged. It is, of course, unnecessary to point out that if this plan is adopted a minimum period of hire must be strictly adhered to—say two years.

GAS IRONS.

For some time past our advance with this apparatus has been rather limited, almost entirely due to the difficulty of obtaining weights for specific purposes. Makers have now turned their attention to this point, and comparatively achieved a result which will be of material assistance in this respect.

LIGHTING.

Many are the occasions on which we are told that gas lighting is dead; but in spite of electricity for this purpose, the use of which may be preferable in large houses and shops, the majority of the homes in the country are medium sized or quite small, and economy becomes the prime consideration.

The improvements in burners and fireproof globes have produced splendid weapons for competition, and should undoubtedly create new business in this field if we continually press home the advantage of gas as an illuminant, which is superior to electricity if looked at from the point of health, assists in warming the room, is generally cheaper, and is most certainly more dependable.

In the past many undertakings have not thought it worth while to worry about the lighting load; but the fact that gas is being used constitutes an advertisement, and every opportunity should be seized to retain and extend what may seem at the moment not to be worth fighting for. It is generally assumed that business premises, shop, and display lighting come into the category of domestic load, and with the advent of distant control and automatic switches, we have a means of publicity which should be exploited with all the vigour at our command.

APPARATUS.

For a number of years past shoals of shoddy appliances have been manufactured and sold to the detriment of the various undertakings. We are informed they are marketed generally among ironmongers, builders-merchants, and the like. There is not the slightest doubt that if purchasers were not to be found in the gas industry itself, the demand would be so small that their manufacture and circulation would soon become non-existent. How often does one pick up a catalogue still showing, for example, burners of a pattern when incandescent lighting was in its infancy, and is solemnly told by the representative that "We still make these burners, and Mr. So-and-So will not look at any others."

Can we expect to progress with such a state of affairs? The national use of gas brings us into contact with all classes, and bearing this in mind we must see to it that all appliances and their application are extremely simple. Except for possibly a few changes in design the general principle of apparatus has, as far as one can see, practically reached perfection, and the future can be faced with confidence, without fear or trembling of this or that appliance being hopelessly obsolete or ineffective in the course of a few short years.

MAINTENANCE.

This very important section of our activities in byegone days received in many parts scarcely any attention or probably none at all, but if no maintenance system is attempted in the present and days to come, then we fail miserably as a public utility service.

The bare cost of renewals charged to the consumer should assist very largely in the retention of business, or it may even be considered wise policy to bear a slight monetary loss.

MAINS.

Mains of to-day have to carry higher pressures within and increased strains without, and consequently the choice of materials is of the greatest importance, and the unbreakable nature of steel tubes should claim first consideration. The advantage of steel tubes over cast iron is enormously increased by the long lengths in which they are obtained, the general convenience, labour saving, leakage prevention, resiliency, and absence of friction. Subsequent strains due to traffic make it very necessary that the old-fashioned cast-iron pipes with joints every 9 ft. should be laid at a greater depth in order to escape vibration. However well a joint may be made it is infinitely better to have no joint at all, and the adoption of welded joints with steel tubes will result in a continuous pipe line. In a lesser degree strains may and do occur in the ground due to frost; but, more important still, the present-day concrete or asphalte road, owing to its impervious nature, greatly adds to the difficulty in locating escapes. The resultant charges for reinstatement of necessary excavations are accounts which the engineer does not wish to face too often.

SERVICES.

Assuming that our own house is in order with respect to adequate mains, we can at once turn our thoughts to the consumer's service. Every new house erected should mean a potential consumer requiring at least three pieces of apparatus—cooker, gas copper, and geyser—and a service pipe capable of maintaining their efficient use at all periods. A service pipe of 1 in. interior diameter will give a sufficient margin for the average middle-class house. In view of the present-day scheme of house erection of the types covered by the Government subsidy, undertakings can safely standardize upon 1 in. services for such houses.

The policy of wrapping services with hessian or jute is well worth trying. Soils and subsoils vary in nature in different districts, and very often we are called upon to lay pipes in what is usually termed "made up ground." Past experiences show us that the corrosive powers of mixed earths are considerably in excess of virgin soil, and the added protection of such a covering will go a long way towards securing immunity from accident and danger with their attendant liabilities. Jute wrapping of 6 in. width can be readily procured at quite reasonable rates; for buying the wrapping is, in many respects, better than purchasing tubes already covered. The application to the pipes prior to laying in the trench is only a matter of a few

minutes, and ensures no fraying ends, rubbed patches through careless transport, or rough handling, and is certain to be in a fit condition to receive its final coat of hot tar before the reinstatement of the trench.

Reviewing services that have been in existence for a number of years, we can understand our predecessors utilizing one main tapping for 5 or 6 houses when they had such a slow and laborious job cutting a hole with a chisel, using the reamer (sometimes in a hole more elliptical than circular), and finally tapping the thread, to say nothing of probably causing a fracture in the process, entailing a short length of new main and another commencement of operations.

The advent of drilling and tapping machines has made our path easier, and we can find no excuse for following their example of utilizing one trunk service for 6 or even 8 houses.

How often do we find an old service of ¾ in. diameter endeavouring to meet the demands of this number of houses with a like number of appliances, the consumer making very little complaint except at cooking periods for the very simple reason that an adequate supply has never been his to enjoy. Relaying and improving services such as these is of vital importance and cannot be shelved indefinitely, but immediately taken in hand as the occasion arises.

CARCASSING NEW BUILDINGS.

Architects and builders of the present day are gradually making it a practice to equip the premises they are erecting more fully, and our utmost endeavours must be used increasingly and without ceasing to impress upon them that no building is complete without an equipment of gas appliances and, wherever possible, gas lighting. Persuading a builder to fix a cooker, geyser, copper and one or two fires may seem too high to aim; but if we can, in the course of erection, instal a comprehensive scheme of carcassing, we shall be ready for future requirements, and apparatus can be connected with a minimum of disturbance and at a minimum cost.

The question of meeting the cost of carcassing is an interesting one. Some may favour a contribution from the builder, while others may be quite prepared to provide all that is necessary free of cost. As was mentioned earlier in this paper, service begins with the installation of apparatus, and it may be the wisest policy to make ourselves entirely responsible for all that is required in this connection. At any rate one point will be scored—a constant and efficient supply to the consumer.

Turning to the question of lighting and heating of shops, offices, public buildings, and factories (I think we can justly consider these premises as a domestic load, as they are decidedly distinct from manufacturing processes), we are constantly told the best artificial light for any purpose is that which nearest approaches daylight. In incandescent gas lighting we claim to have this, and our success is undoubtedly dependent on how we can convince by demonstration the truth of our statement. The more publicity we can obtain in this respect the easier the work becomes. No amount of literature or advertising will suffice.

The problem is not on the same plane as heating appliances. The vagaries of electric lighting call for the provision of emergency lights, and we find all progressive people have more or less extensive systems of such lighting. Let us make the most of the opportunity by demonstrating on such emergency points how much is being missed in efficiency and economy.

As an illustration of demonstration with emergency lights perhaps I may be forgiven for quoting two examples of occurrences in our own district. The proprietor of a large drapery store was so delighted with the efficiency of semi-direct lamps in our showrooms that he unhesitatingly decided to adopt them for his own purpose, and instead of their being emergency lights they have become utility lighting. The second example, one outside lamp and two triple burners with three No. 2 mantles were fitted, and the consumer is so satisfied that he alternates his lighting nightly, gas and electricity.

Make the fight for the lighting a real and vigorous one, and free our minds from any thoughts of gaining an easy victory. Business men to-day are more concerned with saving expenses than a few years since, and we can, without fear of contradiction, prove that overhead charges may be considerably lessened by the adoption of incandescent gas lighting.

Discussion.

The PRESIDENT stated that he was all in favour of a long term of hire-purchase system. On the question of "dud" appliances, the time had come when complete control for the installation of apparatus should be obtained by a governing body for gas companies, as with the water companies. This was done in America, where data as to efficiencies of appliances were supplied, and the governing body of control stamped the apparatus with distinctive seals. Steel mains had come to stay, owing to their many advantages; but strict supervision of laying should be more seriously carried out, especially with the wrapping of mains.

Mr. W. M. PATERSON (Bath) stated that legislation could be advantageously brought forward on many points, especially with housing schemes. For instance, a provision for adequate flues in all rooms where apparatus was to be fixed. Many rooms had no flues, and the insertion of temporary flues into the cavities of cavity-walled houses should be stopped. Supervision of internal fittings and piping was carried out at Bath, and all fixed to the Gas Company's specification. With regard to the testing of appliances, most gas companies knew what they were buying; thus testing was only necessary with unknown installations of outside fitters. It should be the policy of all undertakings to keep down the price of gas; and therefore the fixing, &c., of apparatus would tend to increase the price of gas.

Mr. S. LLOYD (Weston) said that where the provision of flues had not been left, it was an easy matter to fix an efficient and inconspicuous flue.

Mr. H. J. ALLEN (Weston) stated that where space was limited it had been found possible to fix a temporary wash-boiler with flex tubing, and remove the boiler when work had been completed.

Mr. J. T. SPENCER (Weston) thought that service connections to steel mains were not satisfactory, though the Parkinson nipple was fairly efficient. It was usually recognized that the makers' wrapping on service pipes was better than the gas companies wrapping their own *in situ*.

Mr. A. BARRETT (Frome) remarked that the life of steel mains would depend largely upon corrosion. The cost of fixing, &c., of apparatus should not be charged on the price of gas, but added to the cost of apparatus for hire-purchase system.

Mr. HARRIS, in reply, stated that in piping new houses, branches were always fixed for other apparatus. The system of hire-purchase was largely governed by the neighbourhood supplied. At Trowbridge, most of the consumers were farm labourers, who would find it impossible to buy apparatus outright, but could manage over a fairly long period.

A hearty vote of thanks was proposed by Mr. W. BARBER (Cheltenham) and seconded by Mr. WILLMER (Bath), to which Mr. Harris suitably replied.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Warrington Gas-Works, Saturday, Feb. 2, 1929.

A large number of members visited these works, and were received at the works offices by the Chairman, Councillor J. Wood, and the Gas Engineer, Mr. A. Cook. The Chairman gave a few words of welcome, after which the party divided into three groups, and was conducted over the works, the guides being the Engineer and his assistants, Messrs. Burton and Lloyd. At the Warrington Works, the carbonizing plant consists of Woodall-Duckham continuous vertical retorts.

Gas was first made in Warrington in 1820, and in the following year the town was first lighted by gas. The undertaking was controlled by the Warrington Gas Light and Coke Company until 1877, when it was taken over by the Corporation. At that time the annual make of gas was 128 million c.ft. The growth of the undertaking may be seen by the following figures:

Year.	Make in Millions.
1877	128
1898	282
1914	549
1925	565
1928	659 = 3,121,354 therms

Gas making at the Mersey Street Works ceased in 1897. The showroom is at Mersey Street, also offices, warehouse, governor house, and three small gasholders.

After inspection of the works the members reassembled at the Town Hall. The Mayor (Councillor Stringer) gave them a welcome as the civic head of Warrington, and was supported by Councillors Starkey, Bolton, Sinclair, Bardsley, and Makin, and also Mr. Shewring, of Rochdale, and Mr. Yates, of Goole.

Mr. H. J. HAILSTONE (President) said that they had spent a very profitable time. It was the first time their Association had visited the Warrington Gas-Works, though they had been to the two gas stove works in that town.

Mr. E. H. STONE (Birkenhead), proposing a vote of thanks to the Mayor and members of the Gas Committee, spoke of the advantages of having a Gas Committee who were alive to the progress of their industry. It must have been of great assistance to the Engineer, Mr. Cook, to whom, in the course of his further remarks, Mr. Stone paid a very high tribute.

Mr. DUXBURY (Oldham) seconded the vote.

Councillor SINCLAIR said it was very pleasing to hear the complimentary remarks that had been passed upon their works. He also mentioned the importance of the gas stove industry at Warrington.

Mr. COOK thanked them for their kind remarks, and expressed his pleasure at having the Association at his works. He remarked upon the manner his Committee had received his proposal that the Association should pay them a visit, for the Committee realized that

they themselves had benefited by visiting other works. In conclusion Mr. Cook made special reference to the work of his staff.

GAS-WORKS ROLLING STOCK.

By A. H. BURTON, A.M.I.Mech.E., Assistant Engineer to the Warrington Gas Department.

LOCOMOTIVES.

These are usually of the 0-4-0 type, having a wheel base of 5 ft. 6 in., and side or saddle tanks. As most works yards have some severe curves, a short wheel base is essential, unless there is incurred the added expense of leading and trailing pony trucks, or axles having radial boxes. In either case the type is changed to 2-4-2. Generally speaking, the 2-4-2 type is unnecessary, as the 0-4-0 will "corner" quite comfortably on the sharpest curve around which coupled wagons will run without becoming buffer-locked. The radius of such a curve is 65 ft.; assuming that the gauge of the track has not been excessively widened.

The tractive effort is derived from the formula $T = \frac{D^2PL}{W}$, where D = diam. of cylinders; P = mean effective pressure lbs. per sq. in.; L = length of stroke in inches; and W = diameter of driving wheels in inches.

One driver and one shunter are employed with each locomotive, and in addition a disabled man as cleaner. As one engine is sufficient for practically the whole year, I propose to give the costs accordingly, based on one year's working.

	£	s.	d.
Wages (driver, shunter, and cleaner)	507	19	0
Coal	105	6	0
Oil	5	12	6
Water	6	17	0
Maintenance (wages and material)	83	10	3
	£709	4	9
Tons of coal shunted	45,000		
Cost per 1000 c.ft. into holder	0·261d.		

The maintenance costs given above are inclusive only of such work as would, in railway practice, be done in the running sheds. Larger repairs have usually been the subject of tenders by locomotive engineering firms.

We have experienced some little trouble with tubes burning thin at the smoke box end, and have, therefore, built a firebrick arch below the bottom row of tubes to prevent direct contact with the flames. This has not been in use any length of time, but I see no reason why it should not correct the trouble, as it is, or used to be, standard railway practice.

WAGONS.

Practically all wagons owned by the Warrington Corporation Gas Department are fitted with end doors for tipping. We have, however, a few of the hopper type. These latter are among the first twenty, and have been running 30 years. They are all converts; that is to say, they have been converted from the old solid wood buffer type to spring buffers. We have a few 8-ton wagons, but the greater number are of 10 tons capacity. The construction is practically identical. We have no steel wagons, and I am led to believe there are usually heavy maintenance costs with wagons constructed of this material, especially if wet coal or coke are carried. This of course is to be expected.

The Warrington Gas Department own 2 tank wagons, carrying sulphuric acid for the sulphate plant, 63 coal wagons, and 7 coke wagons.

We do most of our own repairs, but every year a dozen or so are sent to wagon building firms for a thorough examination and overhaul, so that each wagon has this attention every five years. The cost of these overhauls varies according to the age of the wagon, and is between £5 and £15 each.

CAPITAL VALUE AND INVESTMENT CONSIDERATIONS.

The capital invested in our wagons for external traffic is in the neighbourhood of £5000, which has been depreciated by half.

In considering the advisability of purchasing wagons, the prospect is not an alluring one from the investment point of view. In fact, the profit may well be *nil;* but so long as no great loss is incurred in the wagon account, there will be an indirect profit varying according to the cost of wagon hire. This profit of course cannot be shown in the accounts.

In support of my remarks regarding the diminutive profits likely to accrue I give the following figures:

Take the present-day cost of a 12-ton wagon at £150, and assume the life of the vehicle will, barring accidents, be 30 years. To recover the capital invested, apart from interest, the net profit per wagon per annum would have to be £5. After paying insurance and maintenance, the average net earnings per wagon over six post-war years is £12 7s. 6d. per annum. Deducting £5 depreciation leaves £7 7s. 6d. Interest at 4 p.ct. equals £6, thus leaving a net return of £1 7s. 6d. The capital invested is, therefore, only yielding 1⅛ p.ct.

The following figures will be of interest regarding the working of coal wagons:

—	Pre-War.	Post-War.
Journeys	69	43
Net earnings per journey	1s. 3¼d.	5s. 8d.
Tons carried per journey	6·9	8·9
Gross earnings	£7 19s.	£19 6s. 5d.
Maintenance	£3 10s.	£6 19s.
Depreciation	£2 10s.	£5
Interest	£1 17s. 6d.	£6
Net profit	1s. 6d.	£1 7s. 6d.

The drop in journeys per year since the war is due to several factors, such as increased carrying capacity of the wagons, collieries working short time, and less coal being carbonized, due to a much higher yield per ton being obtained.

In spite of the somewhat depressing aspect of private ownership of wagons, there are several bright spots, not the least of which is the facility with which deliveries may be accelerated or retarded according to the amount of coal in the works. This is especially valuable during the winter. Again, during disputes in the coal industry such as the last, when imported fuel saved the situation, we found our wagons invaluable in bringing our supplies from the port, especially as, in some cases, there was the possibility of having to bear the cost, or part thereof, of a claim by the shipowners for demurrage.

ROLLING STOCK FOR WORKS USE.

We have a few old coal and coke wagons available for this traffic, but more generally use four-wheeled bogies. These are built on the same lines as the standard wagon so far as the sole is concerned.

Each bogie is capable of carrying two of the dump boxes; these latter being handled by the cranes. These bogies and boxes may seem a little crude, but in effect we have been doing for years what the railway companies have recently inaugurated, namely, providing large boxes whereby goods may be delivered to the consignee's address without further handling than placing these boxes on motor lorries. We find these boxes cheaper in use than dump cars, as when sending ashes, clinker, &c., to the tip, the crane can empty the boxes clear of the track, thereby obviating the necessity of sending labourers to clean up.

When breeze is required at the boilers, the boxes are shunted to the screening plant, and, when filled, brought back and emptied by the crane. The cost of this work is indeed small, being 4·4d. per ton for small quantities, and proportionately less for greater quantities. This of course is brought about by the facility with which the boxes are filled; this remark also applying to the discharge of the boxes at the boiler house. If the breeze was loaded and discharged by hand, I doubt if it could be done at less than 1s. 6d.

CRANES.

We have two cranes—one 5 tons capacity, and the other 3 tons.

That of 5 tons capacity is a locomotive slewing and luffing crane, having a gauge of 6 feet. It is placed on a gantry 22 ft. high, on one side of which is a branch siding. On the other side is the works roadway, so that goods arriving, or for despatch, may be handled with the greatest facility. This crane is used to empty boxes of breeze at the boiler house, and handles all the larger mains and such miscellaneous supplies as arrive from time to time by road or rail. It has proved most useful during the building of the No. 2 vertical retort installation, the No. 2 carburetted water gas plant, the coke screens, and alterations to our purifiers.

Since the completion of the above extensions this crane is usually only in operation three days a week, the supply of breeze to boilers, and pipes to mainlayers, being regulated accordingly.

The 3-ton crane is a standard 4 ft. 8½ in. gauge similar to the larger. It has proved most useful in loading coal out of stock with a grab, and carries out the work at a wages cost of 4·8d. per ton. This includes the wages of the driver and an assistant. The second man is necessary when grabbing from the coal bays, as the grab has rather a limited space in which to work—between the rails and the walls. It is, among other things, the assistant's duty to see that the grab will fall clear.

We have in progress the raising of the coal store roof by 7 ft. 6 in., so that this crane may operate over the full length of the overhead railway. This machine is also used for loading pitch into wagons; boxes of a similar type as used for breeze being employed. At such times as the 5-ton crane is without steam, the smaller is used for loading mains and discharging breeze boxes.

The versatility of a crane may be illustrated by the fact that the first extension of our concrete coal store, carried out in 1921, was speeded up considerably by grabbing the foundations for the columns.

In each case the driver does his own cleaning, and washes out the boiler after about 250 hours' steaming. A very satisfactory boiler fluid is used, so that if blown down once daily

there is very little mud to be removed when washing out takes place.

While speaking of cranes, I would say they are both provided with a grab, thus further reducing the cost of removing such material as may advantageously be handled in this manner. This does not include coke, unless one has a very fine market for breeze.

MOTOR VEHICLES.

At present we own only two of these—a 30-cwt. end-tipping War Office Subsidy type, and a popular "tonner." The former is employed mainly on domestic coke deliveries throughout the whole year. The latter acts as a tender to the distribution department, and is also employed on coke deliveries as occasion requires. We have found it more satisfactory to employ two men on the 30-cwt. vehicle, as deliveries are thereby considerably accelerated. The fuel consumption of both is high, owing to the work requiring so many stops and starts. The miles per gallon on the 30-cwt. rarely exceed nine, and the total cost per ton of coke nuts delivered in half-cwt. bags averages 1s. 10d.

Repairs have been reasonably low, as since the purchase of the 30-cwt. vehicle in October, 1925, at a cost of £437 10s., the replacements have totalled £18 13s. 1d., or 4·2 p.ct. of the cost.

The vehicle is overhauled every summer by the driver and his assistant, the cost being one week's wages for the two men.

Alterations to the body and repairs have cost about £20 in three years, including wages and materials. The alterations were necessary, as we found it impossible to load 30 cwt. of loose vertical coke. We therefore raised the sides and ends about 12 in.

The 20-cwt. lorry is rather more economical as regards fuel consumption; this being about 12 miles per gallon. This, quite conceivably, may be partly due to the wheels being fitted with pneumatic tyres, whereas the other has solid tyres. On the other hand, repairs and new parts have accounted for £24 2s. 1d., or 15·1 p.ct. of the purchase price of £159 6s., despite the fact that this vehicle has been in use eighteen months less than the 30-cwt.

Deliveries by the smaller lorry cost slightly less than by the larger, this being accounted for by the increased mileage per gallon of fuel, and the fact that only one man is employed.

Discussion.

Mr. H. J. HAILSTONE (Rochdale) complimented Mr. Burton upon his paper, and said the figures were of great value, and not to be found in the usual textbook.

Mr. J. T. HAYNES (Bolton) remarked that cranes were a judicious expenditure of capital, and were invaluable for keeping down costs, but, of course, not very practicable for small and congested works. It was generally found that each works adopted a particular type of handling plant, of such a character as to be suitable to the conditions prevailing. Even in the case of an ordinary wheelbarrow he had found that the men had a preference for a certain type; and upon investigation it was generally found that there was a great deal to be said for their preference, having in mind, of course, the conditions prevailing at the particular works.

Mr. S. CARTER (Liverpool) said the paper was unusual; and he gave his experiences concerning 14-leaf springs as against 5-leaf ones. Steel frames for wagons were not as useful on a gas-works as the wood frames, on account of the acid reaction. He was in favour of the private-owned railway wagon, and money could be saved, if the trips were carefully watched, and wagons not sent on the long trips where they were lost sight of, and perhaps lost for two or three days.

Mr. W. L. HEALD (Preston) gave some interesting figures concerning the costs of various rolling stock.

Mr. E. H. STONE (Birkenhead) also gave some figures in connection with the rolling stock at his works.

Mr. H. PLATT (Bolton) proposed that the thanks of the members be given to the author of the paper, and Mr. F. N. BOOTH (Rochdale) seconded, to which Mr. BURTON suitably replied.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Visit to Kirkcaldy Gas-Works.

On Saturday, Feb. 2, a Meeting of the Association was held at Kirkcaldy. The visitors were met at the works by Mr. Robert J. Gavin, Chief Assistant, who is the President of the Association for the current session, Mr. J. Shand, and others of the staff, who conducted the members in parties over the plant.

Following the inspection, adjournment was made to the Anthony Hotel, where, by the kindness of Mr. J. Kincaid, Engineer and Manager of the Kirkcaldy Gas Department, the visitors were entertained at tea.

Mr. JOHN SCOBIE (Dunfermline), Vice-President of the Association, expressed the thanks of those present to Mr. Kincaid for the privilege of inspecting the works. Those members, he said, who knew the old works would have noted the great transformation made by the installation of the "W.-D." vertical plant. Thanks were expressed also to the gentlemen who had conducted the visitors round the works.

Mr. KINCAID, in reply, said he had always taken a keen interest in the affairs of the Association. His interest was especially marked this year since a member of the Kirkcaldy staff occupied the President's Chair. It was a pleasure to observe that the membership was maintained, and that the enthusiasm continued.

Mr. GAVIN then intimated that, owing to a serious family illness, Mr. David Warden, of Dundee, had found it impossible to attend that day, and in consequence his paper on "Maintenance" would not be read.

PRESSURE WAVE CONTROL OF STREET LIGHTING.

By R. AIR, of Crossgates, Fife.

In these days there is a tendency to discard the pressure wave apparatus in favour of clock controllers, and in my opinion this ought not to be, if the pressure wave apparatus is sufficiently understood and properly adjusted. It has always been suggested that ample reserve of pressure is essential to ensure the wave and the success of the system, and while this may be partly correct, the system which is now in operation cuts out this argument.

In the area of supply at Crossgates which is under my control, the gas supply is obtained from a high-pressure main reduced to normal requirements by means of a Reynolds governor.

For many years the street lighting, which is on the pressure wave system, was operated on the "increased" pressure wave, and while it worked quite satisfactorily, there was difficulty at times in getting the necessary reserve of pressure to operate satisfactorily, due to lack of pressure caused by too small mains.

A few years ago the method of operation was changed, with distinct benefit all round; and it is this method to which I wish to refer particularly.

The pressure on the district is maintained at 40-tenths at the governor outlet as a minimum, and each apparatus is set to drop at 35-tenths, the pressure being set at this during the adjustment of the lamps at the beginning of the season. In this way it will be observed that all the drums are up during the whole 24 hours; and when it is desired to light or extinguish the lamps, the pressure on the district is reduced by 5-tenths for three minutes, thus allowing the drums to fall. Immediately the pressure is restored, the drums rise and operate the valve to light or extinguish. This I call the "reverse" wave.

THE REVERSE WAVE.

This method has been found to work more successfully than the former, and has many advantages in its favour. The pressure drop is not so disturbing or damaging to consumers' fittings. It is less dependent on reserve of pressure in excess of normal requirements. It allows of every freedom to increase the district pressure at any time without fear of upsetting the controllers, or lighting the lamps in consequence.

The present-day requirements are for good pressures in the district, and as the apparatus has a safety seal equal to 9 in. of water, ample freedom is thus afforded. It has to be noted, of course, that the normal pressure must not fall below that for which the apparatus is set, or it is certain that the lamps will operate.

There are 60 lamps in my area, and the successful results obtained by this "reverse" operation gives me every confidence in recommending its adoption where any difficulty is experienced. I may say that in Aberdour—another district supplied by the Cowdenbeath Gas Company—the same system is in operation with equally satisfactory results.

In order that those present might fully understand the method, Mr. Air gave practical demonstrations with a model he had brought with him.

Discussion.

Mr. GAVIN, opening the discussion, said he considered that the subject had a wide application, and they had witnessed the demonstration with interest. Many in the profession had believed that pressure wave systems were a "back number." Here, however, they were shown a method by which some of the difficulties incidental to these controllers could be overcome. He wondered if in all areas the drop of only 5-tenths would be sufficient to operate all lamps satisfactorily.

Mr. AIR replied that he had no hesitation in recommending this system anywhere, and said that 5-tenths reduction would be found ample. With clock controllers the lamps were frequently lighted too early; whereas with this arrangement it was always best to wait

until dusk, when there would be a draw on the mains. As long as this was waited for, the 5-tenths reduction was adequate.

Mr. J. SCOBIE (Dunfermline) considered that consumers' burners were very sensitive to any diminution of pressure, and while this might easily be met by a "gasman," it was a very different matter from the consumers' point of view.

Mr. AIR replied that a drop of 5-tenths was so little, and, as it applied over a period of approximately only 3 minutes, any change was not noticeable.

Mr. DAVID GARRIE (Burntisland) remarked that in his area the Burgh Surveyor was really responsible for the street lighting. The positive wave system was in operation, and the failures amounted to about 2 p.ct. There was trouble occasionally with odd lamps, due, generally, to an accumulation of water or rust in the service pipe. Last year they had carried out a trial of the system described by Mr. Air. In Burntisland they were working ordinarily to 32-tenths of pressure, and as there would have been a bad drop of pressure if lowered, a small gas engine was fixed up, and the gas was boosted to 5 in. In trying out the reverse system they dropped down to 3 in., but the percentage of failures was found to be rather high, and they tried from 5 in. to 2½ in., when satisfactory results in the lamp operations were secured. It was thought, however, that in cases where a consumer's gas burner might have been left "in a peep," the light would go out on such a large reduction taking place, and then when the pressure was restored to normal the gas would be blowing. Again, the gas engine used for boosting was found on occasions during the day to misfire once or several times, and so, possibly, cause a drop of an inch, so that as soon as the engine picked up again and pressure was restored a few lamps were seen to be lighted. Because of the difficulties it was decided to revert to the original positive wave system.

Mr. AIR agreed that difficulties must arise wherever there was an accumulation of water or rust. At the beginning of the lighting season, when the controllers were being set and the lamps overhauled, examination was made for this, but usually it was only found necessary to employ the force pump. Provided that be done, and very great care be taken in adjusting the weights upon each individual control bell, he was sure that satisfactory operations would result.

Mr. M. DARLING (Cowdenbeath) said that, as Mr. Air pointed out, the reverse wave system was in use at Aberdour. It was first tried there because the holder threw only 5 in. of pressure, and, during the holiday season, when so many visitors were about, the draw was so great that there was not sufficient extra pressure available to operate with an increased wave system. Since the adoption of the reverse wave perfectly satisfactory results were obtained. It was essential, of course, to have clear service pipes and mains, and to exercise care in first adapting the lamps. It was equally necessary to wait until dusk for the first lighting operation. Within premises it becomes dark earlier than it does outside, and as the lighting burners are put into use by the consumers there is a consequent draw on the mains. This resulted in a 5-tenths drop serving adequately. He recalled that it was a very difficult matter to convince Mr. Air originally that the reverse wave was efficacious. Now they had evidence of his enthusiasm over its success.

Mr. AIR agreed that he did have serious doubts as to its merits in the first instance, but these, after an extended trial, were now dispelled.

MECHANICAL HANDLING AT THE BUENOS AIRES GAS-WORKS.

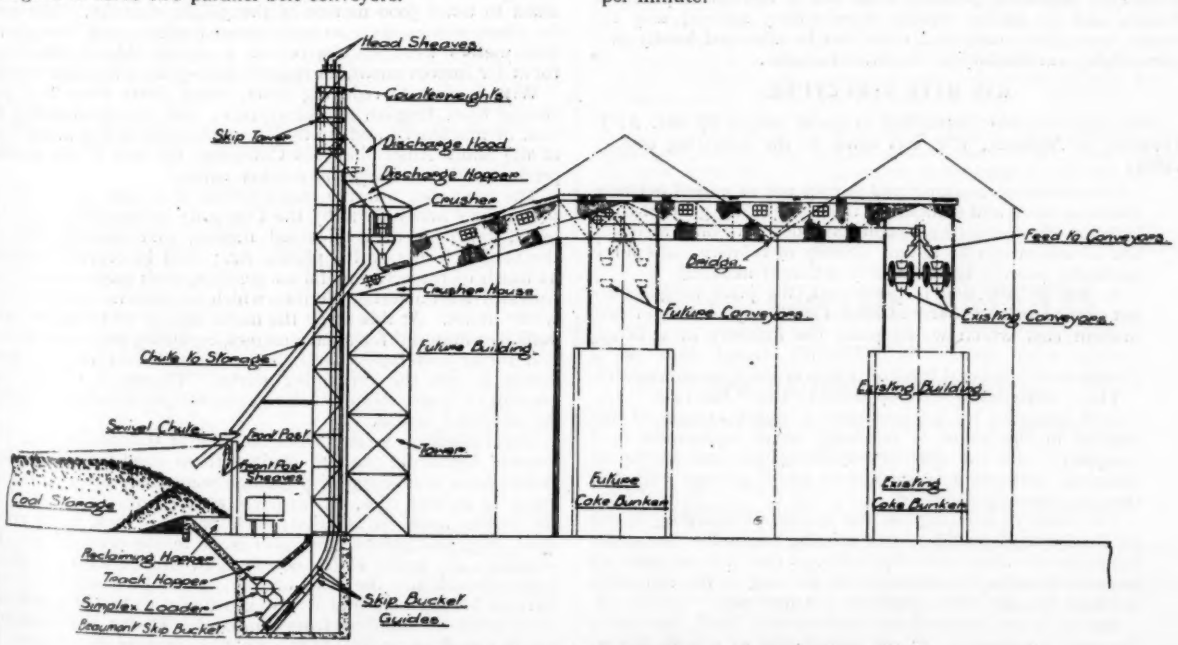
During the past few years striking progress has been made in the field of mechanical handling—a subject of primary importance to the town gas industry. This article is descriptive of a complete coal handling equipment supplied to the Primitiva Gas-Works in Buenos Aires by the Underfeed Stoker Company, Ltd., of London. The coal used is "run-of-mine" bituminous, arriving at the works in railway wagons with discharge to a concrete track hopper below ground-level, from which the coal is conveyed either to a storage dump or direct to the retorts.

For the latter conditions, the equipment consists of an electrically driven Beaumont automatic skip hoist with "Simplex" patent loader. The latter feeds into continuously running small wagons or skips, which are elevated vertically by an endless wire rope operated by a 30-H.P. electric motor. The normal capacity of this skip hoist is 70 tons of coal per hour, and the discharge is into an overhead steel plate bunker. The whole arrangement is carried by a girder work tower. From the bunker the raw coal discharges through an electrically driven Norton crusher, also of a capacity of 70 tons per hour (down to 2-in. size), driven by a 15-H.P. motor. This passes the crushed coal to an endless mild-steel belt conveyor travelling over the top of the retort setting and discharging to any of the retorts as desired. The belt is 115 ft. long between centres, and 1 ft. 6 in. wide, and runs at 300 ft. per minute. It is driven by a 5-H.P. electric motor, and the capacity is 70 tons per hour. A second belt conveyor will be installed when a future additional bench of retorts is erected, for the skip hoist plant is designed to serve two parallel belt conveyors.

Particularly interesting is the coal storage dump arrangement adjoining the skip hoist, which discharges (by an overhead by-pass chute), in the opposite direction, any desired amount of coal to one corner of the dump, instead of to the Norton crusher. The coal for storage is spread over the entire area, which has a capacity of 14,000 tons when the coal is 20 ft. deep. The coal is reclaimed for supply by a Beaumont drag scraper conveyor having a normal capacity of 100 tons of coal per hour with an average haul of 100 ft.

The Underfeed Stoker Company, Ltd., have taken over the sole manufacturing rights in Great Britain and the British Empire of all Beaumont mechanical handling appliances—particularly automatic skip hoist and drag scraper conveyors—supplementing their "Usco" water sluice ash conveyors, and other equipment.

With regard to the Beaumont drag scraper conveyor, this is made in standard sizes from 20 to 600 tons per hour capacity. The essential principle is that of a large heavy steel bucket or scraper which lies on the top of, and partly penetrates, the pile. By means of cables, the scraper is caused to pass backwards and forwards over the complete surface. It operates from a tower at one end, and a series of suitable tail block posts at the other. An alternative method is to employ a travelling carriage device or tail block car of heavy steel framework, running on rails round the outside of the storage area, and fixed at any point by clamping down. Both methods are installed at the Buenos Aires Gas-Works; the whole arrangement being electrically driven by a 30-H.P. motor with a rope speed of 250 ft. per minute.



COAL HANDLING PLANT AT THE BUENOS AIRES GAS-WORKS.

MIDLAND JUNIOR GAS ASSOCIATION.

On Feb. 2, members of the Association spent an interesting afternoon inspecting the works of Messrs. Mobberley & Perry, Ltd., at Stourbridge.

Inspection was made of the weathered clay bank, where there were large stocks of weathered fireclay which has been in the process of weathering for five to eight years. The firebrick and blue brick yard was visited. One of the chief points the firm study is the burning of refractory goods at a high temperature, to avoid shrinkage of material when at work. In No. 2 Firebrick Yard inspection was made of the manufacture of retorts, tiles, water gas material, &c. The firm have four grinding mills capable of turning out a very large quantity of material, and in addition to these they have a firebrick works at Woodside, near Dudley, which are also capable of manufacturing large quantities of material. The firm's collieries, known as Beech Tree, Foxcote, and Oldnall, have good seams of coal and excellent beds of Stourbridge "Old Mine" fireclay having an average analysis of 75 p.ct. silica and 28 p.ct. alumina. In addition they have a strong clay (average 80 p.ct. silica) which is of great importance in the manufacture of their highest grade material.

VOTE OF THANKS.

At the conclusion of the inspection, a vote of thanks to the Directors and the members of the staff of Messrs. Mobberley & Perry was proposed by the PRESIDENT (Mr. F. Caudwell) and seconded by Mr. W. MCNAUGHTON.

Mr. PERRY responded on behalf of the firm.

GAS PROBLEMS DISCUSSED IN AUSTRALIA.

Extracts from Papers presented at the 1928 Convention of the Australian Gas Institute.

SULPHATE OF AMMONIA.

The manufacture of neutral sulphate of ammonia, which is a comparatively new adjunct to gas production in Australia, is of the greatest importance, said Mr. O. A. Ternes, of Melbourne, in a contribution dealing with this subject. The following figures, showing the increased consumption, largely due to the efforts of the Sulphate of Ammonia Propaganda Committee, speak for themselves:

Consumption of Ammonium Sulphate for Australia from 1922 to 1928 (Inclusive).

Year Ended June 30.	Tons.
1922	7,336
1923	8,692
1924	9,750
1925	10,386
1926	10,461
1927	12,111
1928	14,141

[The consumption for the year 1928 is, therefore, 92 p.ct. greater than that of 1922.]

This increase is most marked in the case of Western Australia. The aggregate amount used there, owing to the smaller area under cultivation as compared with other States, was small (only 401 tons in 1922); yet in 1927 it had actually increased to 2155 tons (an increase of 436 p.ct.). In Victoria, over the same period, it had increased from 1817 tons to 2226 tons (an increase of less than 23 p.ct.). So that, even allowing for the largely increased area under cultivation in Western Australia in 1927, the progress made there was remarkable.

From this it will be evident that, if such an increase were possible with the use of the acid sulphate, there should be no reason (if Australia produce none but a neutral sulphate in future, and its merits become more widely known) why the whole Australian production could not be absorbed locally at a price highly satisfactory to the manufacturer.

GAS RATE STRUCTURE.

This question was considered at great length by Mr. A. J. Dobson, of Adelaide, who has come to the following conclusions:

> Conditions of working and supply are so varied between different cities and companies that comparing general costs between the companies seldom provides data on which any line of action can be taken. (Study of relative costs for a particular process is an entirely different matter.)
>
> So far as Adelaide is concerned, the price of gas does not appear to have become loaded with any factors of permanent cost which would place the industry at a disadvantage with competitive industries should there be a change in the general level of prices in the Commonwealth.
>
> The "differential" as opposed to the "flat rate" system of charging for gas indicates a bigger margin of difference in the value of relatively small consumers to a company; and the cost of supplying gas and service to domestic consumers is subject to much greater variation than is generally supposed.
>
> The value of a change in the system of charging is not so much that it would correct existing anomalies and make the basis of charge more equitable, as that it would give an impetus to sales by automatically passing to the consumer a rebate for any extra appliance put into use.
>
> There is a tremendous undeveloped field for extra domestic appliances. If the installation of a bath-heater, copper, and fire is going to develop a 2000 c.ft. per month consumer into a 4000 c.ft. per month consumer, approximately 76 p.ct. of the domestic consumption in Adelaide could be doubled.

Terminating his paper, Mr. Dobson said: To present consumers the inequalities of the "flat rate" system of charging are not so pressing as to call for immediate revision of price schedules; but the undeveloped field for "extra" appliances is so wide and potential to gas companies that the serious study of the various "differential" charge systems as a means of developing this field is surely worth a place on the policy agenda of every progressive gas company.

METER MANUFACTURE.

Mr. S. R. Preston, of Adelaide, gave an interesting account of the manufacture of meters by the South Australian Gas Company. This, he said, really dates back to the period of the war, when it was almost impossible to obtain meters from England, thereby leaving the Company no alternative but to purchase from America to the best advantage. The American meters on arrival, however, proved very inferior in construction; and such trouble was occasioned that it was decided to rebuild as many of the existing "light" type meters as possible. The first stage in this process was the "blowing down" of condemned meters, and redeeming all metal and brass parts which could be reconditioned and used in the rebuilt meters, and which, under ordinary conditions, would have been scrapped. This procedure was an economic one by virtue of the high prices at which meters were selling at that time, while the cost of meter repairs also showed a reduction as a result of the reclaiming of used parts.

Consideration was then given to the question of manufacturing meters, and, after a thorough investigation, it was decided to build 3000 meters of the 5-light capacity. The parts for these meters were manufactured locally; and, though the first meters were satisfactory to a certain degree, there was room for improvement, as regards both price and construction.

With a view to reducing costs, many parts were then purchased from English manufacturers; and notwithstanding the lack of machinery and up-to-date appliances in the meter shop of the South Australian Gas Company, the cost of the finished product was less than the market value.

The next step was the manufacture of a large proportion of the various meter parts by the Company themselves, using the metal taken from condemned meters, and making dies for the backs, fronts, valve plates, &c.; and in order to reclaim as much of the scrap metal as possible, each meter maker was provided with a receptacle into which to place his old parts and waste metal. At this stage the meter maker was supplied with sufficient material for twelve meters, including backs and fronts, and metal and brass parts, and also sufficient tinplate from which to cut the remaining parts. Though a considerable amount of waste still existed, yet the meters were cheaper than the imported article.

The disabilities arising from the lack of suitable presses, &c., became apparent; and to obviate these conditions a modern Heine press was installed. Though some difficulty was experienced in making dies, all tin parts were eventually stamped on the works, and, in addition, such parts as tees, valve arms, slots, legs, and guides were also made in the press room. To eliminate the waste which necessarily occurred with the press, it was found that the sizes of tinplates as then ordered would have to be altered; and it was gratifying to find that suitable sizes could be supplied from England. To-day the Company are in a position profitably to manufacture their own meters.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Ventilating Underground Chambers.

SIR,—In connection with the question of ventilating all underground spaces beneath our public streets, emphasized during the recent inquiry into the causes of the Bloomsbury explosion, the following case illustrates the danger that may attend such spaces where they are hermetically sealed.

A report was one day received of an escape of gas in the basement of one of our largest theatres; the basement being 6 ft. below ground-level, and the gas issuing at a point beneath a concrete floor 30 or 40 ft. away from the nearest gas main, and 3 ft. deeper. The floor of the basement was very wet; and the gas issued as intermittent bubbles in one corner between the floor and the main wall of the auditorium. The bubbles burned with a slightly yellow flame. Some of the gas was collected and analyzed, and pronounced to be marsh gas.

The presence of the marsh gas is easily explained, as the whole of this part of the city is built on river alluvium. Within a few yards of the theatre above-mentioned, there is a fine bed of oysters, 12 in. thick, only 2 ft. beneath the surface. Below this, at a depth of 26 ft., is a bed of peat 7 ft. thick. Marsh gas has been found in this neighbourhood before, when sinking wells; but this is the first known instance of its appearing at the surface.

If it is possible for such a gas to be generated in the underlying peat, how doubly necessary it becomes for all underground spaces to be adequately ventilated. As far back as 1912 the local postal officials here were approached on this question of ventilation, but replied that the ventilation of postal underground chambers was an engineering impossibility, though at the same time every electric street box in the city was properly ventilated, and had been so ventilated for some years.

Some of the underground chambers here are about 6 ft. square by 6 ft. deep. They are opened at irregular periods, varying from a few days to twelve months or more. A leakage of the minute quantity of $\frac{1}{1000}$ c.ft. per hour (a quantity impossible to detect by any known means, owing to its minuteness), would add sufficient gas to such a chamber in the course of twelve months to produce an explosive mixture.

Each chamber so constructed and frequently situated close to large mains, unventilated, constitutes a grave danger to the public in view of the possibility of small quantities of gas (whether natural or manufactured) accumulating there and forming an explosive mixture beneath the roadway.

"A. Z."

Feb. 7, 1929.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF COMMONS.

Ministry of Transport and Board of Trade.

Viscount SANDON asked the Prime Minister whether, seeing that electricity was not a matter of transport, and that the merchant marine was, he would interchange those two sections of the Ministry of Transport and the Board of Trade, respectively, especially in view of the fact that the latter Department also had responsibility for gas.

The PRIME MINISTER replied that he had noted the suggestion, but did not think it was practicable.

Gas Supplies (Pipelines).

Mr. SHINWELL asked the President of the Board of Trade whether he was aware that in Germany fifty-two leading coal and allied undertakings had co-operated in a scheme to cover the country with arterial pipes for conveying gas over long distances for the use of industrial consumers; and whether the Government contemplated taking action to encourage and assist financially similar schemes in this country.

Sir P. CUNLIFFE-LISTER replied that he was aware of this scheme, that there were several proposals for extending the scheme there, and that on the recommendation of the National Fuel and Power Committee an investigation was now being made, of which Sir Alexander Walker was the Chairman, into the possibilities of a similar system of gas distribution being adopted in particular areas of the United Kingdom.

Railway Carriages (Lighting).

Mr. BUCHANAN asked the Minister of Transport if he was aware that, on passenger trains between Glasgow and London, carriages were being lighted by gas; and, in view of a recent accident and the findings of the Court of Inquiry thereon as to lighting trains by this method, he would take steps to secure in future electric lighting in all carriages.

Col. ASHLEY, the Minister of Transport, replied that he was informed that all passenger rolling stock on the scheduled services between Glasgow and London on the London and North-Eastern Railway was lighted by electricity, and that, as regards the London, Midland, and Scottish Railway, about 99 p.ct. of the vehicles of express passenger trains between London and Scotland were at present electrically lighted. He also said that, as regards the last part of the question, he was unable to add anything at present to the answers given on Nov. 13 last to questions on this subject asked by Mr. Hore-Belisha and Mr. Viant.

Mr. BUCHANAN asked if the Minister of Transport did not think, in view of those inquiries, and in view of the fact that Members of the House travelled frequently in trains which were gas-lighted on journeys covering over 400 miles each, some urgent steps were demanded from him.

Col. ASHLEY replied that he had the whole matter under consideration.

Private Bills.

The Gas Light and Coke Company's Bill was read a second time, and referred to the Examiners of Petitions for Private Bills on Feb. 6.

The Sheffield Gas (Consolidation) Bill was read a second time in the House of Lords on Thursday last, and will be referred to a Joint Committee of Lords and Commons appointed to consider all Private Bills for the exclusive purpose of consolidating the provisions of existing Private Acts of Parliament.

LEGAL INTELLIGENCE.

ALLEGED STREAM POLLUTION BY GAS COMPANY.

L. J. Pettit *v.* Redhill Gas Company.

In the King's Bench Division on Tuesday, Feb. 5, Mr. Justice Macnaghten commenced the hearing of an action by Mr. L. J. Pettit, of Hamme Farm, South Nutfield, near Redhill, against the Redhill Gas Company, in which damages were claimed for injury caused to plaintiff's herd of Friesian cattle and to pasture lands by the alleged pollution of a stream that ran through the farm. The pollution was denied.

Mr. W. CRAIG HENDERSON, K.C., who appeared for Mr. Pettit, a well-known breeder of Friesian cattle, said the plaintiff moved his herd of 76 cattle in March, 1919, to Hamme Farm. In 1920 he saw they were losing in condition, and the milk from them was reduced in quantity, with general signs of deterioration. Young cattle that were born did not develop into vigorous animals, but remained generally in poor condition. He was puzzled; and, although he had noticed oily blots floating on the water of the stream, he attached no importance to them. In 1925 he fell into the stream and was covered with oil when he emerged. The pollution of the stream continued in 1926, when Mr. Pettit communicated with the Redhill Gas Company, for there was no doubt that the stream was being contaminated to an extreme degree by tarry matter from the Company's works. In 1925 the Thames Conservancy Board made three specific complaints to the Gas Company about the pollution of the stream, and a minute of the Company about that time mentioned the increased difficulty of preventing that pollution. Under pressure of the Conservancy Board, the Company erected an iron culvert, in an endeavour to prevent tarry matter getting into the stream; but this did not entirely eliminate the trouble, and in the end the Company stated that the pollution was beyond their control, as it was due to saturation of the soil by rain. Later they alleged that the trouble was at an end, because they had constructed a trough at a cost of £1500, and intended to erect a filter at the point where the objectionable matter was entering the water. Pollution, however, still continued; and the Thames Conservancy had served on the Gas Company a statutory notice to abate it. The pollution considerably detracted from the value of the property. Mr. Pettit alleged that some of the finest feeding ground in the country had been spoiled by the pollution of the stream.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 6.]

Nos. 2794—3606.

BISSELL, W.—"Gas burners." No. 3212.

BRITISH THOMSON-HOUSTON COMPANY, LTD.—"Gas burners." No. 3593.

FRICKER, E. H.—"Device for regulating supply of gas to atmospheric burners." No. 2965.

GAS LIGHT AND COKE COMPANY.—"Catalytic oxidation of organic compounds." No. 2995.

HELPS, A. M.—"Gas-fired boilers." No. 3102.

KEMPTON, C. H.—See Bissell, W. No. 3212.

WILSON, J. H.—"Gas meters." No. 2806.

MISCELLANEOUS NEWS.

GAS LIGHT AND COKE COMPANY.

Ordinary General Meeting.

The Two Hundred and Twenty-Second Ordinary General Meeting of the Proprietors was held at the Chief Office of the Company, Horseferry Road, Westminster, on Feb. 8—Sir DAVID MILNE-WATSON, LL.D., D.L. (the Governor of the Company), presiding.

The SECRETARY (Mr. W. L. Galbraith) read the notice convening the meeting; and the report and accounts were taken as read.

The corporate seal of the Company was thereafter affixed to the register of holders of capital stocks.

The GOVERNOR: Ladies and Gentlemen,—Before dealing with the trading results for the past year, I should like to say something about the capital account. You will first of all notice that we have raised during the year a further £2,000,000 of 5 p.ct. redeemable debenture stock. This issue was effected through our Bankers, and we received the excellent price of £99 for each £100 of stock. I think this is a great testimony to the Company's reputation in the world of finance.

EXPENDITURE ON EXPANSION OF BUSINESS.

The expenditure of capital during the year amounted to £618,000, of which, as usual, far the greater part—viz., £523,000—was on new mains, meters, and stoves. This was rendered necessary owing to our desire to get new business and to furnish an ample supply in those districts where building developments are specially taking place at present. I shall return to this subject later on in my remarks. There is a credit of £96,000 from the amount written off plant and from the depreciation of stoves, leaving a net capital expenditure of £522,000 for the year.

SAVINGS ON REVENUE ACCOUNT.

Turning from the capital to the revenue account, it will be seen that the Company has saved large sums of money on its expenditure on coal and oil. The reduction in the cost of coal to the Company is due to the fact that in the year 1927 we were still hampered with high prices as an aftermath of the coal stoppage. The reduction in the cost of oil is due to the lower prices that have ruled during the past twelve months. There has been a saving under these two headings alone of over £1,400,000. There has also been a large decrease in expenditure, you will notice, under the heading of repairs and renewals of meters as compared with the figures for 1927. This is not due to any slackening off in the Company's policy of repairing and renewing meters, but to the fact that a large part of the expenditure on repairs and renewals undertaken in 1927 is not recurrent.

BENEFIT TO CONSUMER AND SHAREHOLDER.

I do not think there are any other points on the expenditure side of the revenue account which call for special comment. On the credit side you will see that owing to the reduced price of gas the amount we have charged our customers has fallen by over £1,300,000. This, I am sure, will be regarded with great satisfaction by everyone, consumers and shareholders alike, as with the reduction in the price of gas we were enabled to give a very substantial benefit to the consumers, and at the same time declare a higher dividend. [Applause.] There have also been satisfactory increases in revenue from the rental of meters, stoves, and fittings by which may be gauged the extent and scope of the increase in the Company's business.

RESIDUALS.

With regard to residuals, there has been a fall in prices all round. This was only to be expected in view of the reductions which have taken place in the price of coal. Taken as a whole, however, a revenue of over £2,000,000 from residuals must, in the circumstances, be considered very satisfactory.

As I have said, the reduction in the price of gas has enabled the Directors to declare a higher dividend. A dividend for the June half-year was paid at the rate of £5 10s. p.ct. per annum, and now the Directors are in a position to recommend the payment of a dividend at the rate of £5 12s. p.ct. per annum, the full amount permissible with the price of gas at 8·6d. per therm.

To sum up, the result of the trading for the year has been as follows:

AN INCREASED CARRY-FORWARD.

A credit balance of £1,853,000 has been transferred from the revenue account to the profit and loss account as against £1,737,000 last year. This balance, after the interest on borrowed money and the dividends for the June half-year have been debited, together with a contribution of £50,000 to the special purposes fund, leaves a sum of £830,000 from which to pay the charges for the December half-year. This sum will enable the Directors to declare the usual dividends on the 4 p.ct. consolidated preference stock and the 3½ p.ct. maximum stock, and a dividend at the rate of £5 12s. p.ct. per annum on the ordinary stock. These dividends, together with the necessary contribution of £20,000 to the redemption fund, will absorb £671,000, and leave £159,000 to be carried forward to the credit of the current year's accounts—an increase of £37,000 on the amount brought forward from the year 1927. [Applause.]

A SOUND FINANCIAL POSITION.

Looking at the Company's position generally, I am glad to be able to report that we have made very satisfactory progress during the past twelve months, and that there never was a time in the history of the Company when its financial position was in a sounder or healthier condition.

So far as our increase in business is concerned, 1 p.ct. may not seem very large so far as percentages go; but, when you take into consideration the size of the Company, the age of the Company, and the intense competition which we are experiencing from our younger rivals—electricity and oil—I think it may be regarded as very satisfactory. It should be remembered that as some localities more or less reach saturation point, it becomes more difficult to procure an increase in the use of gas. When it is realized that an increase of 1 p.ct. in the Company's total business means roughly 500 million c.ft. of gas, involving the use of as much as 40,000 more tons of coal, and is equal to the supply for a whole year of a moderate sized town, there is no reason to be dissatisfied.

SIGNS OF IMPROVING TRADE IN LONDON.

In this connection it is gratifying to see that the number of public lamps has increased by over 500 in the course of the year, and to know that, while trade generally in the North has been bad, the factories in London—especially in the area of the late Brentford Company—and in the eastern part of our district, have, judging by the amount of gas used, been well employed.

EFFECT OF WEATHER ON GAS OUTPUT—RECENT RECORDS.

A critic, on referring to the capital account may say that we have apparently spent a large amount to get an increase of this kind. On this point I should like to remind you that in the nature of our business we are particularly dependent on the weather, and during the year under review the weather has been all against the Company. We had a remarkably fine summer and an extremely mild autumn and early winter, and these conditions distinctly operated against the sale of gas. It is well to remember that in matters of this kind, taking the long view, our object is first of all to secure consumers, and then to see that their premises are fitted up with proper apparatus, so that when weather conditions are suitable the apparatus is there to enable us to reap the benefit. This is particularly true with regard to gas fires. Our recent experience has shown that we have been amply rewarded for this policy, for in the severe weather during last month we have had a record output of gas for the period, which would not have been obtained had we not pushed the sale and hire of apparatus. If the apparatus is there, people will use gas when weather conditions are right—if the apparatus is not there the gas will not be sold. While dealing with this matter, I would also like to point out that the Board consider that their policy with regard to new showrooms has been amply justified. The showrooms in this building and our new showrooms at Church Street, Kensington; Seven Sisters Road; Kilburn; Finchley Road; &c., have fully justified the large expenditure on them. They have had the effect of making the public realize that modern gas appliances, which are eminently efficient and at the same time artistic, can be employed in houses however beautiful the decorations may be, and therefore these showrooms have been the means of securing a good class of business which we should not otherwise have been able to obtain.

MODERNIZING THE WORKS.

The Company has pursued its policy of putting in modern plant at all its works whenever an opportunity has arisen. Within the last few years several of the works have been undergoing a process of renewal in order that the latest methods of carbonization might be brought into use, and the reduction in the cost of manufacture has been noteworthy. We are still pursuing that policy.

As I have told you on a previous occasion, we have found it very advantageous to own our own ships, and just recently we have ordered three more to run to our up-river stations, where the economy effected by avoiding the unloading of coal lower down the river and barging it up has been very material.

LOW-TEMPERATURE CARBONIZATION—A NEW SMOKELESS FUEL.

On the last occasion on which I addressed you, I told you that the Company, at the request of the Government, was putting up a low-temperature carbonization plant at Richmond. This is now approaching completion, and within a few days we hope to be in a position to supply a smokeless fuel named "Gloco" which we hope will be of a satisfactory character. Very many interesting questions arise out of low-temperature carbonization, especially with regard to residuals. The Company is carrying out investigation and research with a view to finding a new use for the tar and its constituents produced from this method of carbonization.

IMPORTANT RESEARCH WORK.

Many of you, no doubt, have read in the newspapers that in the summer we opened a new central laboratory at our Fulham Gas-Works. Sir Richard Threlfall, Chairman of the Fuel Research Board, was kind enough to come and open this Laboratory, when he made a very interesting speech on the value of research. We in the Gas Light and Coke Company were never more convinced than at the present time of the necessity for research, and we have now working for us at Fulham and elsewhere a highly efficient staff of chemists, who are studying the numerous problems connected with our work. Our central Laboratory, working in conjunction with a full-scale experimental plant, has as its especial object fundamental

research into the problems of our industry as apart from routine laboratory work. There are many problems connected with the nature and carbonization of coal, and we felt that it was only right that a Company such as ours should take its part in this research work on coal, gas, and residuals which has such an important bearing at the present time on the welfare of the country.

GAS MAKING BY COKE OVENS.

Many of you may also have seen in the newspapers a report that we are considering the question of the installation of coke ovens at our Beckton Works. We have received tenders for this work and are engaged at the present time in considering them. It has long been our desire to have a battery of coke ovens on our own works, as we have reason to believe that from many points of view coke ovens are admirably suited for the production of gas and residuals. This shows that we, as a Company, have no prejudice against coke ovens forming part of a gas-works.

It has been assumed by a great number of people that there is antagonism between the gas industry and the coke oven industry. Nothing is really further from the case, because we regard ourselves as having shown the way to the bye-product coke oven industry. When the coke oven industry was merely supplying coke for foundry purposes, there was, perhaps, little connection between the two, but since the recovery of bye-products, there has naturally been greater community of interest between the two industries. Both industries, in my opinion, are part and parcel of one great industry—namely, that of the carbonization of coal. They should try to work together, bearing in mind the special object of each industry—one being gas and the other coke—and so help to solve some of the great difficulties of the country—namely, the iron, steel, and coal problems. I think if both industries approached this question in a friendly manner trying to understand one another's difficulties, and not trying to "down" each other, a great deal of good would come to both industries and also to the country generally. [Applause.]

THE NATIONAL ASPECT OF THE GAS INDUSTRY: OBSOLETE LEGISLATION.

There never was a time probably when greater prominence was given to what I may call the national aspect of the gas industry than at the present moment. As you know, the Government appointed a National Fuel and Power Committee, of which I had the honour to be a member, and that Committee has made a series of recommendations which are of great importance to the industry.

The gas industry is a very old industry, and the general legislative provisions under which we work date back as far as 1847, and in many respects are quite out of date. We are hampered as an industry by inadequate and old-fashioned methods of raising capital—restrictions which do not apply to our younger rivals; we are handicapped with limitations in the handling of our residuals; and we are limited with regard to working with allied industries. There are many other minor disadvantages under which we labour. The industry feels that it has a real grievance, and this has been fully recognized, I think, in the Committee's Main Report, where it is recommended that we should be allowed to adopt more up-to-date methods and to bring ourselves into line with modern practice. I am glad to say that the Government has promised to introduce a Bill giving effect to some of those recommendations. The industry would have preferred to have a completely new Charter, but we realize that in the last session of a Parliament we could not possibly expect to get a Bill dealing with all our grievances; therefore, we welcome, as a first step at any rate, the Bill which the Government propose to introduce, hoping and believing that it will not be long before we obtain, whatever Government may happen to be in power, a further relief from the trammels which hinder us.

I should like, while on this subject, to make it quite plain that it is not dividends we are after. What we want is freedom to get new business and to compete successfully on modern lines with our rivals who are not subject to so many restrictions as we are.

GOOD RELATIONS WITH WORKERS.

With regard to labour matters, I am glad to say that we have had no difficulties during the past year. I cannot imagine any Company having a more loyal and faithful body of workers than this Company has. [Applause.] I am convinced that there is a definite feeling of enthusiasm for the Company among those who work for it, and, as I have said on previous occasions, this is due to a great extent to the co-partnership or family spirit which permeates the whole Company. I cannot pass from this subject without saying how deeply touched I was when the many thousands of co-partners of the Company decided last year to subscribe among themselves and to present me with my portrait, and my wife with a very beautiful tea service. We were deeply touched by this expression of their goodwill, and it was one of the proudest moments of my life when the portrait, which was painted by that eminent artist, Sir William Orpen, R.A., was presented to me at Olympia last May.

THE HOLBORN EXPLOSION.

The last days of 1928 were clouded over by the explosion which took place in the Post Office tube in Holborn on Dec. 20. As the matter is now being inquired into by a Commission appointed by the Home Office, it would be out of place for me to make any remarks on this occurrence. The staff of the Company, both officers and men, worked splendidly night and day during the anxious time that followed the explosion, and everything was done to mitigate the inconvenience and trouble caused in the district. It is particularly gratifying to the Company to have received expressions of appreciation from many sources, and particularly from such a body as the Royal Westminster Ophthalmic Hospital, whose premises were within the affected area.

INVESTMENT OF FUNDS.

There is one other matter to which I would like to call your attention, and that is, as you will notice from the balance-sheet, the reduction in two of the funds which are placed on deposit at interest with the Company—namely, the officers' superannuation fund and the co-partners' (non-staff) pension fund. As explained in the report, this is due to our having carried out the pledge I gave to the Chairman of the Committee of the House of Commons in 1926 that as soon as we were in a position to do so—that is to say, when new capital had been obtained—we would invest some of these funds in outside securities. We have accordingly handed over to the Trustees of the funds for investment a sum of £750,000. The investments naturally belong to the funds themselves, and are, therefore, not shown in the accounts.

THE STAFF.

With regard to the staff of the Company, as I have said already, I have nothing but praise for both officers and workmen for the way they have carried out their duties, and to them is due the Directors' thanks for their efforts.

It would be invidious to mention any particular persons by name, but, when referring to the staff, I would like to say that we have appointed Mr. R. W. Foot, General Manager of the Company. Mr. Foot has been acting as Assistant General Manager for some years, and the Board considered that he had fully earned the title of General Manager. [Applause.]

THE INDUSTRIAL SITUATION.

With regard to the position of industry in the country generally, you will remember that at our meeting last year, I referred to the question of co-operation between Capital and Labour, and no doubt you have seen in the papers a good deal with regard to this matter. It is premature at the present moment to say what will be the outcome of the meetings that have taken place, but I think I can confidently say that, so far, nothing but good has resulted. During the past year, the atmosphere between employers and employed has been of a much more friendly character, and I sincerely hope that at a later date, when matters have been further discussed, we shall enter on a period of better understanding between the two parties chiefly responsible for the success of industry.

There never was a time when it was more necessary that the two sides should understand one another, and anything which brings employers and employed in closer touch with one another is good. I believe that frank discussions and friendly meetings will do a great deal to help solve the difficult problems which lie before British industry before it can once more take its old place in the world's economic position.

British industry has gone through a very trying time, and, though we are not out of the wood, I think there is no use in despairing or in constantly belittling what has been done by this country from an industrial point of view. There are few countries which have suffered more severely by the war or whose industry has been more disorganized than that of Great Britain. We have been able to weather the storm, and have, to a certain extent, recovered a great deal of lost ground. We have put ourselves, at any rate, in the position of earning the respect of the world, in that we have shouldered our burdens, financial and otherwise, in a determined way, and, though complete success has not been achieved industrially, yet we are, I believe, on the high road towards it. [Applause.]

I have pleasure in moving:

> That this meeting do agree with and confirm the Report of the Directors' and the Auditors' Report and Statement of the Accounts of the Company for the year ending on the 31st December, 1928.

But before putting the resolution to the meeting, I shall be happy to hear any remarks which proprietors may wish to make, and to endeavour to answer any questions they may ask.

The DEPUTY-GOVERNOR (Mr. Henry Woodall, M.Inst.C.E.): I have much pleasure in seconding the adoption of the report and accounts.

After a few questions had been asked by shareholders, the resolution was put to the meeting, and carried unanimously.

THE DIVIDENDS.

The GOVERNOR: I will now ask the Secretary to read the minute of the Court of Directors recommending dividends for the past half-year.

The SECRETARY thereupon read the following from the Directors' minutes of Jan. 25:

> Resolved, that it be recommended to the Ordinary General Meeting of Proprietors to be held on the 8th proximo:
>
> (1) That the sum of £20,000 be set aside out of the divisible profits of the Company for the half-year ending on the 31st day of December last towards the Redemption Fund, in accordance with the provisions of the Company's Acts of 1903 and 1926, and
>
> (2) That Dividends as follow for such half-year be declared, namely:

On the 4 p.c. consolidated preference stock, at the rate of	£4	0	0	p.c. per annum
On the 3½ p.c. maximum stock, at the rate of	£3	10	0	,, ,, ,,
On the ordinary stock, at the rate of .	£5	12	0	,, ,, ,,

All subject to deduction of income-tax.

These recommendations were adopted, on the proposition of the GOVERNOR, seconded by the DEPUTY-GOVERNOR.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR: Two Directors (the Hon. Clive Bigham, C.M.G., C.B.E., D.L., and Sir Harold Brewer Hartley, C.B.E., M.C., F.R.S.) retire by rotation at this meeting, and offer themselves for re-election. Both gentlemen have been Directors for some time, and are known to you personally, so that it is not necessary for me to say anything to recommend the motion to you. I therefore beg to move their re-election.

This was seconded by the DEPUTY-GOVERNOR, and unanimously agreed to.

Thereafter the Auditors (Messrs. J. A. Stoneham and P. H. Ashworth) were re-appointed.

EXTRAORDINARY MEETING.

The Proposed Transfer to the Company of the Undertakings of the Grays and Tilbury Gas Company and the Pinner Gas Company, Ltd.

The GOVERNOR: That concludes the business of the ordinary meeting, and I will call upon the Secretary to read the notice convening the extraordinary meeting.

The SECRETARY read the notice convening the meeting, and the heads of the Bill as follows:

PART I. (Clauses 1-4.)

These clauses are purely formal.

PART II. (Clauses 5-39.)

This part effects the transfer to the Company of the undertakings of the Grays and Tilbury Gas Company and the Pinner Gas Company, Ltd.

Clause 7 provides for the issue of ordinary and preference stock of this Company in substitution for the ordinary and preference stock of the Grays and Tilbury Gas Company as follows:

For each £10 "A" share, with a standard rate of dividend of 10 p.ct., £18 10s. of ordinary stock of the Gas Light and Coke Company.

For each £10 "B" share, with a standard rate of dividend of 7 p.ct., £13 of ordinary stock of the Company.

For each 6 p.ct. preference share of £10, £15 of 4 p.ct. consolidated preference stock of the Company.

Clause 8 provides for the issue of debenture stock of the Company in substitution for debenture stock of the Grays and Tilbury Company as follows:

£166 13s. 4d. of 3 p.ct. consolidated debenture stock for each £100 of the 5 p.ct. Grays and Tilbury perpetual debenture stock;

£133 6s. 8d. of 3 p.ct. consolidated debenture stock for each £100 of their 4 p.ct. perpetual debenture stock; the Grays and Tilbury 6 p.ct. redeemable debenture stock being replaced by an equal amount of a new class of Gas Light and Coke Company 6 p.ct. redeemable debenture stock.

Clause 9 provides for the issue of ordinary and preference stock of the Company in substitution for the ordinary and preference stock of the Pinner Company as follows:

For each £5 10 p.ct. ordinary "A" share, £12 10s. of ordinary stock of the Gas Light and Coke Company.

For each £5 7 p.ct. ordinary "B" share, £8 15s. of ordinary stock of the Company.

For each £5 6 p.ct. preference share, £7 10s. of the Company's 4 p.ct. consolidated preference stock.

Clause 10 provides that the mortgage debentures of the Pinner Company shall become mortgage debentures of the Gas Light and Coke Company.

Clauses 11-16 are the usual clauses relating to the creation of the new stocks, &c., and providing for the payment of sums of cash *in lieu* of fractions of £1 of securities of the Gas Light and Coke Company.

Clauses 17-33 contain the necessary financial and other provisions which are required in connection with the acquisition of the two undertakings.

Clause 34 provides for the charging for gas in the districts now supplied by the Grays and Tilbury and Pinner Companies of prices in excess of that for the time being charged in the main part of the Gas Light and Coke Company's area of supply. The prices charged by the Grays and Tilbury Company are 13d. and 14·2d. per therm as compared with the 8·6d. now charged by the Gas Light and Coke Company; while the price charged by the Pinner Company is 13d. per therm. It is proposed to give the consumers of both companies an immediate advantage of 1d. per therm, which will stand for three years. The clause further provides for an additional reduction of 2d. per therm spread over the following nine years, until in 1942 permanent differentials of 1·4d. and 2·6d. per therm in the Grays and Tilbury district and 1·4d. in the Pinner district are reached.

Clause 36 deals with the declared calorific value in the Grays and Tilbury district and in the Pinner district.

Clause 37 confers on the Company additional powers of raising loan capital up to 50 p.ct. of the share capital issued for the purposes of the amalgamation.

Clause 38 provides for the payment of compensation to the Directors and Auditors of the Grays and Tilbury and Pinner Companies for loss of office.

Clause 39 provides for the taking over by the Gas Light and Coke Company of such of the Grays and Tilbury and Pinner Companies' salaried officers as they may elect to employ, and for the payment of compensation for loss of office to such as may not be taken over.

PART III. (Clauses 40-46.)

This part of the Bill contains various powers as to the acquisition, holding, use, and disposal of lands.

Clauses 40-43 contain powers of purchasing, compulsorily, certain lands, described in the second schedule, adjoining the Company's Shoreditch, Stratford, and Staines Works, and part of the site of the Company's meter repair works at Pound Lane, Willesden.

Clause 44 authorizes the Company to use as gas lands the lands described in the third schedule to the Bill, being lands at Shoreditch and Staines, including those referred to in the preceding clause and land already owned by the Company at Beckton.

Clause 45 contains powers of purchasing, by agreement, additional land for the purposes of the Company's undertaking to the total amount of 200 acres.

Clause 46 amends the conditions under which the Company may sell surplus land, substituting the authority of a resolution of the Directors for that of a resolution of a general meeting.

PART IV. (Clauses 47-52.)

Clause 47 enables the Company to lay mains outside the limits of supply. This is particularly necessary to enable the Company to connect up their area with that of the Grays and Tilbury Company.

Clause 48 removes certain difficulties in obtaining access to premises in connection with the fixing and inspecting of gas apparatus.

Clause 49 amends the Gas Regulation Act to enable the Gas Referees to make suitable prescriptions for the testing of gas from which moisture has been removed.

Clause 50 increases the total amount of the remuneration of the Directors.

Clause 51 enables the Company to apply their funds for the purposes of the Bill; and

Clause 52 provides for the payment by the Company of the costs of promoting the Bill.

The GOVERNOR: Ladies and Gentlemen,—As you have just heard, the main object of the Bill is the acquisition of two more undertakings. As you know, amalgamation has been the policy of this Company for many years, and we feel that it is a policy that has been in every way justified. As a result of these amalgamations, we are able not only to supply gas more cheaply in the new areas, but, by the advantage we possess in having at our command greater facilities for the provision of new capital, it is possible to develop business more rapidly in these outlying areas than would have otherwise been the case. In return for this, the older districts belonging to the Company will reap such advantage as must follow from an extension of the Company's business with regard to the sale of gas. The results of the provisions in the Bill as to price will be very satisfactory to the new districts. The graduated concession in price, amounting in all to no less than 3d. per therm, means that the consumers in these areas may look forward to a steady reduction for some time to come in the price of gas as a result of the amalgamation. After this reduction has been made, there will remain a small differential price in both of the new areas, which their geographical position fully justifies.

The resolution approving of the Bill, having been moved by the GOVERNOR and seconded by the DEPUTY-GOVERNOR, was unanimously agreed to.

A VOTE OF THANKS.

Mr. H. RAYNER: Once again I have the pleasure of proposing a vote of thanks to the Directors and employees of all grades in the Company's service for their labours during the past year, and also to the Governor for another of his speeches of absorbing interest. The pleasure of moving this vote is all the greater, on account of the fine results that have been achieved. From the point of view of the proprietors, no doubt, the most important result is that a higher dividend is being paid—the highest, I imagine, within the memory of anyone in this room to-day. But a dividend is not everything. Perhaps some of you will remember the tale told from the Chair by a former Governor of the Company, about a very avaricious investor in many different companies who possessed a parrot, and who boasted strongly about the wonderful way in which he had taught this parrot to talk. But when the bird was tested by other people, it was found that its vocabulary was a very short one indeed, because the only word it could repeat was "Dividends, dividends, dividends." Now the moral of that little tale is that, although dividends are necessary, they are not everything, and that a better remark which the investor could have taught his parrot would have been "Stability first and dividends afterwards." To-day we have both dividends and stability. Not only has a higher dividend been declared, but a substantial sum is being carried forward to the undivided balance—a matter of sincere congratulation, and particularly so when we bear in mind that, as a result, the market price of the Company's ordinary stock stands to-day above par for the first time for very many years. [Applause.] All the Directors are real experts, some of them in the technique of gas manufacture, some in the law, and some in high finance—altogether, I venture to think, an ideal combination. I should like to add that, taken as a whole, the staff and workmen are competent and zealous in the interests of the Company. You have just sanctioned the motion for a Bill in Parliament for an addition to the Company's already huge territory. In case any shareholder is beginning to fear that the undertaking has become vast to the extent of being unwieldy, I would like to remind him of what is being done in the field of electricity. The effect of this Bill, if passed, will be in the direction of a unified supply of gas, in very much the same way as the supply of electricity is being unified. By means of a Bill such as this, and legislation brought into line with modern requirements, I think the Company should have no difficulty in holding their position in fair competition with all rivals. We can rest assured that the Directors require only a fair field and no favour. I have much pleasure in moving this resolution of congratulation and thanks.

Mr. WEBSTER: As an old employee of the Company, I should like to endorse the words of the mover of this resolution, which I have the greatest pleasure in seconding. I should also like to endorse the Governor's remarks with regard to the loyalty of the workmen. With an experience of 36 years' service under the Company, I can say definitely that it would be impossible to work with a more loyal set of men than I have. There is loyalty throughout the whole of the Company, both with the officers and men. With regard to the co-partnership, I should certainly like to see more of the co-partners retain their shares when they retire.

The motion having been carried with acclamation,

The GOVERNOR said: In return for the handsome compliments that have been paid us by the mover and seconder, I can only state, on behalf of my colleagues, that I thank you very much for your encouragement. We try to do our best; and we do sincerely appreciate the kind things that are said of us at these meetings.

BLOOMSBURY EXPLOSION INQUIRY.

Concluding Stages.

(Concluded from p. 364.)

Tuesday, Feb. 5.

Colonel Thomas was able to resume his attendance at the inquiry on Tuesday.

Prof. *R. V. Wheeler* (Professor of Fuel Technology at Sheffield University, and Director of the Safety in Mines Research Board Experimental Stations), whose assistance had been placed at the services of the Commissioners by the Board of Trade, was called by the Commissioners to give evidence, and presented a memorandum in which he expressed the belief that the inflammable gas which exploded in the Post Office tube was coal gas—this belief having been arrived at as the result of his study of the scene of the explosion and of the evidence given at the inquiry. Some of his detailed examinations were made in company with Col. Thomas.

From his own observations, and from the evidence of eye-witnesses of the explosion, he had concluded that the explosion of inflammable gas and air had travelled nearly throughout the length of the Post Office tube, and that the point of origin of the explosion was at the manhole outside the Post Office in Broad Street (the manhole at which Thrower, the Post Office worker, was injured).

In coming to this conclusion as to the point of origin, said Prof. Wheeler, he had had in mind comparable explosions (of firedamp and air) in the roadways of coal mines that he had investigated, and experimental explosions of firedamp and air and coal gas and air, in long steel tubes, 1 ft., 3 ft., and 7½ ft. in diameter, which he had conducted. In all such explosions the progress of the flame had been slowest, and the dynamic effects least, at the point of origin. He had had in mind also the evidence of eye-witnesses of the explosion, in particular that of Mr. A. Standley with regard to what happened after Thrower went down the manhole.

He believed the inflammable gas to have been coal gas. It was, in his opinion, impossible that the shattering effect so noticeable along the tube and in the roadway could have been produced by a methane-air explosion, and highly improbable that it could have been produced by a petrol-air explosion. Both of these, in the absence of any condition which could produce extreme turbulence of the mixture, were mild explosions. On the other hand, an explosion of coal gas and air, so soon as the detonation stage had been reached, would produce such damage to the tube and to the roadway as had been observed.

Mr. MILLER (Counsel for the Gas Company) said that, as the result of the presentation of Prof. Wheeler's memorandum, he was in a rather difficult position. Prof. Wheeler had introduced a new view, in that he had concluded, from experiments, that the results produced by the explosion at Holborn could not have been produced by explosions of methane and air. Formerly it had been conceded that the explosion might have been due to petrol vapour, fermentation gas, or coal gas, or a mixture of them, with air.

The ATTORNEY-GENERAL said he did not accept the suggestion that all parties had conceded that.

Mr. MILLER retorted that he was prepared to argue that point.

In view of the highly technical and abstruse nature of the problem, Mr. Miller intimated that he did not think he could help the Commissioners very much by cross-examining Prof. Wheeler. He asked the Commissioners and Prof. Wheeler, therefore, to consider a memorandum prepared by Prof. Bone by way of answer to Prof. Wheeler's suggestions.

The CHAIRMAN said that the Commissioners had a very difficult task, and would do their best to fulfil it. The purpose of the inquiry was purely to elucidate facts, and not to allocate responsibility; and their ambition was to give every latitude they possibly could. It appeared reasonable that Prof. Bone's memorandum should be read, and that Prof. Wheeler should express his views about it, as suggested by Mr. Miller.

The ATTORNEY-GENERAL, who was asked for his opinion, said he did not desire to offer opposition or criticism of the suggestion.

PROF. BONE'S STATEMENT.

In his memorandum, Prof. Bone said that Prof. Wheeler assumed that (i.) the observed mechanical effects of the Holborn explosion could not have been produced except a true "detonation" had been developed, and (ii.) in the absence of "extreme turbulence" "detonation" could not possibly have been developed in any methane-air mixture in the tube. But in Prof. Bone's view, while (i.) was very questionable, (ii.) seemed merely an assertion incapable of proof. On the contrary, there were conditions of rapid burning in gaseous explosions, intermediate between those of the initial stage of "inflammation" and of true "detonation," in which violent mechanical effects were produced. Therefore, it was not necessary to assume the occurrence of a true "detonation" to account for the results of the Holborn explosion. Indeed, from the character of the damage occurring to the tube and roadway in the Holborn explosion, and from the fact that the manhole covers were lifted intact and propelled into the air, Prof. Bone was doubtful whether a true detonation was ever set up in the Holborn explosion. Had there been a true detonation, he would have expected that, no sooner had it been set up, there would have been an almost simultaneous shattering of the tube and manhole covers, and that such shattering might have extended even to the roadway itself. The lifting and propelling of the manholes intact into the air suggested to him a much slower pressure development than the practically instantaneous development characteristic of detonation. From his observations and information of the kind of damage caused by the Holborn explosion, it did not appear to him to have been (so far as gaseous explosions went) a particularly violent one; though in popular estimation it may have appeared so.

While it might be true that there was no recorded instance of a true "detonation" having been observed in any methane-air explosion which had been scientifically studied in tubes at ordinary temperatures and pressures, he could conceive of something sufficiently approaching thereto (so far as the damage actually observed was concerned) arising under favourable conditions in the Post Office tube. He could not accept Prof. Wheeler's view that turbulence favoured or promoted the setting up of "detonation;" on the contrary, there was, he said, plenty of experimental evidence that, while turbulence promoted rapid spread of ignition and flame, it prevented "detonation." He could not share Prof. Wheeler's view that it was so impossible for the damage observed in the Post Office tube explosion to have been produced by a methane-air explosion, and so highly improbable that it could have been produced by a petrol-air explosion, that coal gas only must be held responsible for it.

Prof. WHEELER, replying to Mr. Miller, said he did not rule out entirely the possibility of petrol-air mixtures. He said he did not claim that methane-air mixtures could not set up a detonation wave. They could under very special conditions of restriction, which conditions were not present in the Post Office tube.

THE CLOSING SPEECHES.

The ATTORNEY-GENERAL summed up on behalf of the Post Office. With regard to the nature of the mixture which exploded, he asked the Commissioners to accept the view put forward by Prof. Wheeler that the coal gas theory was the most probable. There was no difficulty in making that theory square with the facts as to gas leakages. The Commissioners had certainly not explored every leakage of gas in the affected area. Leakages from the 48-in. main, and from the 4-in. main in Shaftesbury Avenue, had been explored more particularly; but there were other mains which had not been considered. The facts that had been proved in this respect, however, were, in his view, sufficient to support the theory that coal gas was the cause of the explosion. On the other hand, there were no facts proving the generation of anærobic fermentation gas. He did not contest the conclusion that the point of origin of the explosion was at the manhole outside the Post Office in Broad Street, but he pointed out that Prof. Wheeler had been noticeably silent on the question as to the cause of ignition. Evidence had been given as to the finding of a lighter, and he commented that the evidence given by three men as to a statement made by another man with regard to the use of a lighter on the morning of the explosion would not be admissible in a Court of Law. However, it was given for what it was worth. There were very good reasons for being in a state of agnosticism so far as the cause of ignition was concerned. There were one or two rather curious facts about the lighter. It appeared to be open to question whether the facts as to the way in which it was found, and the place in which it was found, were consistent with the theory that it was dropped in the manhole by Thrower (the Post Office worker who was injured there, and subsequently died) and was shovelled out later together with some other material. Another important point was that the flint was not in the lighter at the time it was found; the flint could not have been expelled by the explosion. Indeed, the evidence with regard to the lighter was more consistent with the theory that Thrower did not use it in the tube than that he did. The only circumstance in favour of the use of the lighter was that it was difficult to conclude how the ignition was caused otherwise.

Dealing with the question of the ventilation of the Post Office tube, he said that if the Gas Company had given the Post Office information as to the leakage from the 48-in. main, and more particularly the leakage from the 4-in. main in Shaftesbury Avenue, it was possible that the Post Office would have been put on their guard, and would have carried out some special work in the tube, and possibly the disaster might have been avoided. He submitted that if there were leakages of gas in the neighbourhood of any street, subway, or tube, it was right that the Gas Company should give an intimation of it to those responsible for those subways or tubes. It would conduce to public safety if a recommendation were made that leakages of gas should be brought to the attention of public authorities responsible for such subways.

Mr. MILLER said that the questions as to the part of the tube in which the explosive mixture was fired, and the cause of ignition, were now beyond dispute, in view of the finding of the lighter near the manhole outside the Post Office in Broad Street. Mr. Miller stressed the point that the explosion could, and should, have been prevented had the Post Office tube been ventilated; and that it was the action of the Post Office in connection with that tube which had led up to the disaster. The generation and leakage of any gas, whether it be anærobic fermentation gas, petrol vapour, or coal gas, might be harmless if it were allowed to dissipate in the ordinary way; but in this case there had been provided a space in which any gas could accumulate until the point was reached at which it became dangerous. The only abnormal circumstance in this case was the presence of an unventilated tube, and that was the primary matter in which the general public were interested. There was nothing abnormal about small leakages of gas from the mains of any properly managed and thoroughly well equipped gas company. A company could not avoid leaks occurring sometimes from mains or services, in spite of their precautions; and it was their duty to attend to such defects when they occurred. There had been no suggestion by anyone that in any single detail of its organization had the Gas Light and Coke Company done anything but exercise the greatest skill and energy. A good deal of stress had been laid by the Post Office upon the fact that there had been an escape of gas from a main in Shaftesbury Avenue a few days before the explosion. There had been displacement under the pavement, and the main had cracked;

but it was discovered very shortly after it had occurred, and had been repaired with the greatest possible speed. The incident had no practical importance in connection with the explosion, because the possibility of any considerable quantity of gas from that main getting into the Post Office tube was negligible. Small leakages had been discovered at the joints in the 48-in. main after the explosion, but they could not be pointed to as possible sources of the gas which got into the Post Office tube. In any case, occasional leakages were not abnormal. There was no single abnormality in any of the points which the Attorney-General had investigated. Indeed, he had given a testimonial to the Gas Company. He (Mr. Miller) accepted this, but had not the slightest hesitation in saying that had there been any ground on which the Attorney-General could have based a different view he would have presented it to the Commissioners for their consideration. Dealing with the anærobic fermentation gas theory, he urged that, though the Commissioners had not evidence that this gas was actually forming still, the chemical analyses carried out provided some support for the theory Dr. Haldane had advanced.

The inquiry then terminated.

BOARD OF TRADE INQUIRY AT SOUTHPORT.

A Board of Trade Inquiry was held in the Southport Town Hall on Friday, Feb. 8, into an application of the Southport Corporation for a Special Order under section 10 of the Gas Regulation Act, to enable the Corporation to use certain land in Canning Road for the manufacture and storage of gas. The inquiry was conducted by Mr. J. Ronca, Director of Gas Administration; and Mr. R. E. Perrins (Assistant Town Clerk) represented the Corporation. There were present Mr. John Bond, O.B.E. (Gas Engineer and Manager), Councillor J. E. Hindle (Chairman of the Gas Committee), Councillor F. Scott (Vice-Chairman of the Gas Committee), and Councillors T. Scholes, R. W. Sumner, and J. Cross.

A petition of objection containing the signatures of over a hundred residents in the locality had previously been lodged with the Board of Trade and the Southport Corporation. The main petitioners were represented by Messrs. Dodds, R. Blakeley, N. Rimmer, and Clarkson. Other petitioners were present.

Mr. PERRINS said the proposed site lay between Canning Road and Russell Road, and the premises of the objectors were round about Wennington Road, Cobden Road, Gladstone Road, and Salisbury Street. A Special Order had been obtained for land purchased in 1922, but that land had not yet been utilized. Their intention was to divert the railway line that ran along Butts Lane and Crowlands Street and into the gas and electricity works by taking it across that land. By doing this they would have better facilities for transport than they had to-day. They intended to use the remainder of the land for general gas purposes. The land affected by the present scheme was purchased in 1893, but they had not obtained a Special Order to use it for gas purposes; and this was the object of the inquiry. They proposed to erect a new gasholder almost in line with the existing ones; and the site selected was further from the objectors' property than if they placed it on any other part of the scheduled area. There were engineering difficulties in placing the holder in any other part—particularly on the sites suggested by the objectors. The latter said that the holder would depreciate their properties and jeopardize their health, comfort, and well-being. He would mention that, with the exception of four or five, all the objectors had come to the area in the last four or five years. Few of the properties of the objectors were erected in 1922, when the Corporation obtained a Special Order from the Board of Trade. Those properties were commenced about 1926; and it was not a case of the Corporation going to the property of the objectors. It was a case where the objectors had come to them.

Mr. *John Bond* then gave evidence. He said he was a member of the Institution of Gas Engineers, and a Past-President of the Institution. He had had forty years' gas experience; twenty-five being at Southport. He believed the Corporation erected a gasholder in 1873, and another in 1874, each capable of holding 300,000 c.ft. In 1878, a third holder, capable of holding 1,000,000 c.ft., was erected, and the normal effective storage capacity was about 1¼ million c.ft. The maximum output per day was about 3½ million c.ft., and the output per hour 350,000 c.ft., so that, taking into consideration the effective storage of gas, the delivery would not last more than four hours if gas-making was suspended.

Mr. BLAKELEY said that, if it would shorten the inquiry, they would accept this. They were not contesting the necessity for increased storage capacity.

Mr. *Bond* said they had not utilized the land acquired in 1922 because they were negotiating with the Railway Company, and the remainder of the land would be held for extension, having in mind smokeless fuel. The site proposed by the objectors near Fine Jane's Brook was very bad land on which to erect a holder. The foundations of the holder would intersect Fine Jane's Brook, which drained practically the whole of the land at the back of Ainsdale and Birkdale (the district to the south of Southport) and the south of Southport. There would also be an engineering difficulty with regard to putting two 30-in. mains along Crowlands Street, and to get the mains into the works. The Russell Road site (the other site suggested by the objectors) would take the gasholder close to a firework factory, which he would not recommend, and it would also put them close to two cottages and a farm. They had not purchased the land, and it might be difficult to do so. Again, they might have objections from the cottagers, as the land was not scheduled by the Town Planning Committee. There were also engineering difficulties.

Councillor *Hindle* said that he was a member of the Town Planning Committee. The area of the Gas Estate was zoned as an industrial area, but the other part of the district was classed as residential. In his opinion as an auctioneer and valuer, having due regard to the existing works in the area, the proposed scheme would not affect the value of the property at all. If the holder were placed in the suggested position, it would be far better for the property owners in that particular district than if it were placed elsewhere in the scheduled area.

Mr. DODDS asked if the building societies who were lending the mortgages had been told that a gasholder was to be erected. He represented clients in Southport selling houses every week, and they would not lend £500 or £450 on a £750 house in that area, on account of the proposed holder.

Councillor *Hindle* replied that he did not know whether the building societies knew that the holder was to be erected.

Mr. BLAKELEY said that he realized that the holder could have been placed elsewhere in the scheduled area; and they could not have objected. He maintained that the holder would be a permanent disfigurement of the area.

Mr. BLAKELEY: If the Town Council decided upon the Russell Road site, could the work be carried out?

Mr. *Bond:* They would not do it on my recommendation.

Mr. BLAKELEY: Could it be carried out?

Mr. *Bond:* No.

The INSPECTOR: Why?

Mr. *Bond:* On account of the difficulty with regard to the main, which would have to go through the works and through the foundations of the buildings.

The INSPECTOR: What you mean is that it would be a big engineering job, and a very expensive one.

Mr. *Bond* said that was so. It would also be unsatisfactory, because it would not be easy of supervision. The main would be under the works. He could not lay a main in Crowlands Street, because of the presence of a sewer.

Mr. PERRINS said he thought he had met all the objections in his opening remarks and the evidence called in support of the application. As regards the health question, he thought the objectors had exaggerated it. It was the intention not to manufacture gas on this site, but simply to store it; and there was nothing in this detrimental to health. The Gas Committee had thoroughly considered the proposal, and were doing their best to preserve the amenities of the area.

The INSPECTOR then closed the inquiry, and intimated that he would inspect the proposed site and the properties affected in company with representatives of the Corporation and the objectors.

GASWORKERS' WAGES AT PORT TALBOT.

The position of affairs at the Port Talbot Gas-Works (see "JOURNAL" for Jan. 16, p. 171, and Jan. 30, p. 300) reached an interesting stage at the monthly meeting of the Port Talbot Council (which coincided with the day on which notices expired), when Mr. QUICK, Organizing Secretary of the Municipal Workers' Union, appeared before the Council, and asked for extension of the notices for a further 28 days pending the receipt of legal opinion which they were taking from Sir Henry Slesser on the matter. The Union was challenging the right of Mr. Octavius Thomas to fix the rate of wages of the gasworkers in the Port Talbot area, in view of the fact that there were no fixed wages. There were, he said, no two gas-works in the whole of South Wales paying the same rate of wages. They were also challenging the right of the Government Auditor to interfere with the men's wages. It was an entirely new principle for an individual of this description to issue a challenge in this way. If Sir Henry Slesser advised them that they had a point to contest in law, they would take the matter all the way; if not, they would immediately notify the Corporation.

The MAYOR remarked that he would like to assist their employees in every way possible; but in view of the undertaking which they had given to the Auditor prior to the closing of his audit, he did not see what could be done. Furthermore, until the men reverted to the scale laid down by the Federation of Gas Employers, they were unable to seek re-admission to that body, and they would be in precisely the same position as they were before. The Auditor had threatened to surcharge them; and it was on their definite undertaking to give notices to the men and rejoin the Federation that he had closed the audit without further comment on the matter.

Councillor DAVID REES reminded the Council that the increase came as the result of a conference between the (then) Margam District Council and the Aberavon Council in 1921 (since amalgamated into the Borough of Port Talbot), when certain members stood out very strongly against the idea of an increase.

Alderman TAL MAINWARING pointed out that there was nothing in any Act of Parliament which compelled an employer or employee to become a member of any body. He was not going to be controlled by any public auditor. They retained rights as a Council which he had no power to deal with. He was surprised at the attitude taken up by the Auditor when he visited them.

The MAYOR suggested that the better course to adopt would be to extend the notices for 14 days, and ask the Town Clerk to get into touch immediately with the Auditor, asking his permission. If he refused, then they would have to call a special meeting of the Council at once to deal with the situation.

GAS COMPANIES' RESULTS FOR 1928.

Healthy Development of Business.

BATH.

The report of the Directors of the Bath Gas Company shows that the price of gas was reduced by ½d. per therm from the end of the March quarter, 1928, and the price is now the very low one of 5½d. per therm. An interim maximum dividend of 5 p.ct. per annum, *less* tax, was paid in August last for the half-year ended June 30, 1928, and the Directors recommend the declaration of a dividend at the same rate, *less* tax, for the half-year ended Dec. 31, 1928, payable on Feb. 21.

BRISTOL.

The report of the Directors of the Bristol Gas Company shows that the price of gas was again reduced on April 1 last to 7½d. per therm (3s. per 1000 c.ft.), and the scale of discounts extended, with a view to encouraging increased consumption. The sales of gas have further increased in 1928, and the decreased revenue from gas sales is due to the reductions in price during the last two years. The number of consumers is now 92,743, an increase of 3703 during the year, while the number of cookers on hire is 81,717, an increase of 3454. The make of gas has increased to 4125 million c.ft., which constitutes a record. The undertaking of the Keynsham Gas Company, Ltd., has been acquired, and the district was connected to the Bristol supply on July 1 last. The works have been dismantled, and the Board of Trade have granted an Order under the Gas Regulation Act, scheduling the land for storage purposes and regularizing the Company's position in regard to the district mains. In March last £250,000 5 p.ct. new debenture stock was issued at a fixed price of 96½ p.ct., the issue being over-subscribed within a very short period of the list being opened. The Directors regret the loss they have sustained by the death of Mr. William Windus, who was a Director for over 10 years. The vacancy on the Board has been filled by the election of Major Egbert Cadbury. The Directors recommend that a dividend be declared for the half-year ended Dec. 31 last at the rate of 5 p.ct. per annum (*less* tax) on the nominal capital of the Company entitled to dividend.

CAMBRIDGE.

The Cambridge University and Town Gas Light Company paid an interim dividend at the usual rates, *less* tax, in August last for the half-year ended June 30, and the Directors recommend the declaration of a dividend at the same rates, *less* tax, for the half-year ended Dec. 31, 1928.

CARDIFF.

The report of the Directors of the Cardiff Gas Light and Coke Company for the year ended Dec. 31 last states that, an interim dividend to June 30 last having been paid on the consolidated ordinary stock at the rate of 6 p.ct. per annum, and on the preference stock at the rate of 4½ p.ct. per annum, the Directors recommend payment on March 15 of a final dividend for the year on these stocks at the same rates, *less* income-tax. The revenue account shows a balance carried to profit and loss account of £72,132; and after allowing for interest on debenture stocks for the year of £21,189, bank charges and interest £1160, interest on consumers' deposits £130, income-tax £5365, the half-year's dividend to June 30, 1928, £20,975, and £500 to the reserve fund, there is a balance to be carried to next account, subject to the half-year's dividend to Dec. 31, 1928, of £35,721. Special attention has been paid during the past year to the gas installations supplied to prepayment meter consumers, and the improved lighting fittings which have been supplied are appreciated. The Directors expect to complete this work during the current year.

CROYDON.

As compared with 1927, the sale of gas by the Croydon Gas Company shows an increase of 1·8 p.ct. In the year the number of consumers has increased by 3310, and the demand for gas appliances has been well maintained. The revenue from residuals is disappointing, the prices of coke and tar having fallen considerably. A reduction in the price of gas to 9⅜d. per therm was made from April 1, 1928, and a further reduction to 9½d. per therm has been made with effect from Jan. 1 last. The Directors decided that the time had arrived when the differential price of gas in the Caterham area should cease, and from Jan. 1 last it has been reduced to that ruling in the Croydon area of supply. A new carburetted water gas plant, with the necessary ancillary plant, has been finished during the year, capable of making 3 million c.ft. per diem. During the year property has been purchased at Caterham for the provision of a new showroom to replace the present inadequate premises, and in Brigstock Road, Thornton Heath, for a new showroom to serve that area. The Directors have also accepted a tender for the building of a new showroom at Wallington, the demands of the district having outgrown the one at present in use. The accounts show that, after deducting June dividends (at the rate per annum of 7½ p.ct. on the preference stock, 5 p.ct. on the maximum dividend stock, and 7 p.ct. on the sliding-scale stock), providing for all fixed charges, carrying £10,000 to reserve fund, £10,000 to renewal fund, and appropriating £10,000 to the pension fund, there remains for division a balance of £65,220; and the Directors recommend that dividends be declared for the half-year at the undermentioned rates p.ct. per annum, *less* income-tax: Preference stock, 7½ p.ct.; maximum dividend stock, 5 p.ct.; and sliding-scale stock, 7 p.ct., leaving a balance of £23,078 to be carried forward to the next account.

DORCHESTER.

The report of the Directors of the Dorchester Gas and Coke Company for the year ended Dec. 31 last states that the demand for gas has been well maintained; and the Directors again announce a further increase in the consumption over the year of 2,388,900 c.ft., or about 3½ p.ct. Towards the end of 1927 the price of gas was reduced by 4d. per 1000 c.ft. A further reduction of 2d. was made during 1928. These reductions, though producing a slight diminution in the aggregate amount received from sales, have resulted in a substantial increase in the output of gas. The Directors recommend a final dividend of 10 p.ct. on the ordinary capital, free of income-tax, and 6 p.ct. on the preference capital, *less* income-tax.

The Directors of the Dorchester Gas Fitting Company, Ltd., recommend the payment of a dividend of 1s. per share, and propose to carry over a balance of £1011 unappropriated.

MALTON.

The report on the year's working of the Malton Gas Company states that the sale of gas has again increased, and is more by 333,000 c.ft., or 1665 therms, than in the corresponding half-year twelve months ago. The balance of profit is £2585, against £1545, but the corresponding half-year's accounts were debited with £1000 in respect of stoking machinery, which, added to the latter amount, makes the profit practically the same. The receipts from residuals are less than a year ago by £300, but this amount has been balanced by a saving in the cost of coal, though the price of this is likely to increase, due to restriction of supplies. There is a balance of £3663 brought from the last accounts; and after paying income-tax, interest on mortgage bonds, and transferring £1700 to the reserve fund, there is a balance available for the payment of dividends of £4088. The Directors recommend a payment of 6½ p.ct. actual for the half-year, free of income-tax, which will absorb £1560, and leave £2528 to be carried to the next account.

NEWCASTLE.

The report of the Directors of the Newcastle-upon-Tyne and Gateshead Gas Company for the year ended Dec. 31, 1928, shows that the revenue was £1,152,062, and the expenditure £958,072, leaving a profit for the year of £193,990, to which are to be added dividends from the Redheugh Bridge Company amounting to £520. The balance brought forward from the previous year amounted to, from the Newcastle Company £34,737, and from the Tynemouth Company £4206, making a total gross profit for the year of £233,454. The Directors recommend the following appropriation: Interest on debenture stock, loans, &c., to Dec. 31, 1928, £48,727; interim dividends paid August, 1928, preference stock at £2 p.ct., and ordinary stock at £2 10s. p.ct.; final dividends to Dec. 31, 1928, preference stock at £2 p.ct., making 4 p.ct. for the year, and ordinary stock at £2 13s. 9d. p.ct., making £5 3s. 9d. p.ct. for the year, leaving a balance to be carried forward of £50,481. The price of gas was reduced by 0·4d. per therm from the readings of the meters in September last, making the price 0·6d. per therm less than that charged prior to the mining dispute. An Order of the Board of Trade was issued in March last, sanctioning the acquisition by this Company of the Tynemouth Gas Company. The transfer has been carried out, and the accounts of the two Companies are combined in the accounts submitted.

NEWPORT (MON.).

The revenue account of the Newport (Mon.) Gas Company for the year shows an expenditure of £121,377, with a balance carried to the profit and loss account of £19,224. An interim dividend at the statutory rate of £5 p.ct. per annum on the consolidated stock of the Company for the half-year ended June 30, 1928, having been paid, it is now recommended that a final dividend at the same rate be declared for the half-year ended Dec. 31, 1928.

PORTSMOUTH.

The report of the Directors of the Portsmouth Gas Company states that the quantity of gas sold during the year has again shown an increase. There has also been a satisfactory development in the number of consumers and in the number of gas appliances sold and let on hire. The price of gas throughout the area of supply was reduced by ½d. per therm in April last, and by a like amount in October last. The two reductions amount to 12½ p.ct., the price to ordinary credit consumers within the City of Portsmouth now being 7d. per therm, or 2s. 7½d. per 1000 c.ft. The Directors recommend that a dividend of 5 p.ct. on the 5 p.ct. maximum stock, and of 8 p.ct. on the consolidated stock, both *less* income-tax, be declared for the year ended Dec. 31. The amount carried forward after payment of the total dividend would be £45,902. About 16 acres of land, adjoining the northern boundary of the Hilsea Works and belonging to the War Department, having come into the market in June last, the Directors bought it with a view to future extensions of the Company's manufacturing and storage plant. During the year the mains have been extended to Denmead, and the demand there for gas has been very satisfactory.

PRESTON.

The Directors' report on the Preston Gas Company states that the total profit amounted to £29,729, to which a carry forward of £8446 had to be added. The interim dividend absorbed £10,045, interest on mortgages £7739, and interest on temporary loans £487. Dividends are recommended at the rate of £5 p.ct. on the preference stock, and £3 10s. p.ct. on the "B" stock, *less* tax in each case.

The total sum left to be carried forward to the next account is £11,101.

PUDSEY.

The sales of gas by the Pudsey Gas Company show a decrease of 2·1 p.ct. when compared with the previous year, which is due, in a great measure, to the local authorities in the Company's area of gas supply adopting electricity for public lighting, and also to depression in trade. A reduction in the price of gas to 8·6d. per therm was made from the meter readings in June. The balance of net profit, after deducting the interim dividend at the rate of 10 p.ct. per annum, paid on Aug. 1 last, amounts to the sum of £13,639, from which the Directors recommend the proprietors to declare a dividend for the past half-year at the rate of 10 p.ct. per annum.

READING.

The Directors' report of the Reading Gas Company shows that the sales of gas during the year amounted to 1,219,350,300 c.ft., an increase of nearly 23 million c.ft. The price of gas was reduced in Reading from the midsummer meter readings by 4·6d. per 1000 c.ft. (1d. per therm) and larger reductions were made in the prices charged in outlying districts. In addition to this, the rental charges to prepayment consumers have been reduced. During the year £10,163 has been transferred to the reserve fund, which now amounts to £53,811. An issue of £28,910 5 p.ct. debenture stock was made in June; the issue being largely over-subscribed. The purchase of the land near the Kennet's Mouth for providing additional storage accommodation has been completed, and it is hoped to start the erection of a new gasholder thereon in the near future. To meet the cost of this, and other extensions, additional capital will be required, and the Directors propose to make an issue at an early date. Interim dividends at the statutory rates for the six months ended June 30, 1928, were paid on Sept. 1 last, and the Directors now recommend that dividends at similar rates for the half-year ended Dec. 31, 1928, be paid on March 1 next, *less* income-tax.

SCARBOROUGH.

After providing for interest charges and the dividends on the preference stocks, the Directors of the Scarborough Gas Company recommend the payment of the usual dividends on the ordinary stocks for the year ended Dec. 31, 1928, at the rate of 5 p.ct. per annum; on each of which 2½ p.ct. for the half-year ended June 30, 1928, was paid as an interim dividend on Aug. 10 last; and the remaining 2½ p.ct. for the half-year ended Dec. 31, 1928, will be payable on and after Friday, Feb. 22. This will leave a balance on the profit and loss account of £1522 to carry forward. The sale of gas for the year shows an increase of 20 million c.ft. (3·4 p.ct.) over the previous twelve months. The manufacturing and distribution plant has been maintained in an efficient condition. The Directors decided to reduce the price of gas, after the December meter readings, from 9½d. to 9d. per therm to all consumers, which reduction is equal to 1½d. per 1000 c.ft. During the latter half of the year applications were invited for 462 5 p.ct. registered redeemable mortgages of £100 each at the price of £98 per mortgage, repayable at par on Jan. 1, 1949, and all of these were allotted. One half of the amount standing to the credit of the reserve fund account has been carried to the special purposes fund account which had to be formed under the provisions of the Company's Consolidation Act, 1927. During the year a sum of £9000 was invested in consolidated 4 p.ct. loan in order that the amounts standing to the credit of the reserve fund and special purposes fund should be covered by investments.

SUNDERLAND.

The report of the Directors of the Sunderland Gas Company for 1928 states that the profit and loss account shows that, after deducting interim dividend, there is an available balance of £21,384, out of which the Directors recommend the payment of a final dividend of £3 p.ct., *less* income-tax, making £6 p.ct. for the year, payable on March 9, leaving £12,398 to be carried forward. Mention is made of the election of Mr. Norman S. Cox, the General Manager, and Mr. C. Dru Drury, Engineer of the Company, to seats on the Board. During the year the Directors were enabled to reduce the price of gas by 2d. to 2s. 6d. per 1000 c.ft., *less* discounts.

WESTON-SUPER-MARE.

The Directors of the Weston-super-Mare Gaslight Company state that an expansion in the sales of gas has been made, the increase over 1927 being 1·63 p.ct., and the total quantity sold is over 306 million c.ft. The Directors recommend the payment of the maximum dividend of 5 p.ct. on the ordinary stock, the maximum dividend of 6½ p.ct. on the 6½ p.ct. redeemable preference stock, and the maximum dividend of 6 p.ct. on the 6 p.ct. redeemable preference stock—all these rates per annum—for the half-year ended Dec. 31, 1928, *less* income-tax. A reduction of ¼d. per therm (2·375d. per 1000 c.ft.) was made at the commencement of the March quarter, 1928.

WEYMOUTH.

The sales of gas by the Weymouth Consumers' Gas Company again show an increase, the amount sold for the half-year being 555,342 therms, or 120,726,600 c.ft. This, compared with the corresponding period of last year, shows an increase of 2,585,000 c.ft. The scheme for the renewal and extension of the Company's works is proceeding satisfactorily. The cost of these extensions will necessitate drawing heavily upon the Company's reserve funds and also require raising of additional capital. After providing for the interest on the debenture stock, the balance at the credit of the net revenue account is £17,862, out of which the Directors recommend the payment of a dividend on the ordinary stock at the maximum rate of 5 p.ct. per annum, *less* income-tax.

YORK.

The following report of the Directors of the York Gas Company for the year ended Dec. 31 last was presented at the ordinary meeting at the Gas Offices, Davygate, at 11 o'clock to-day: The profit for the year amounts to £18,334, added to which is the balance of net revenue brought forward from last year of £9211, making a total to the credit of profit and loss (net revenue) account of £27,546. Debenture interest, *less* tax, amounts to £1050; and interim dividend paid at 2 p.ct. on the "A" preference stock, and at 2 p.ct. on the consolidated ordinary stock, *less* tax, amounts to £6720, leaving a total balance of £19,776. The Directors recommend the payment of balance dividends as follows: On £50,000 "A" preference stock at 2 p.ct. (making 4 p.ct. for the year), *less* tax; and on £370,000 consolidated ordinary stock at 3 p.ct. (making 5 p.ct. for the year), *less* tax, leaving a balance of net revenue to be carried forward of £10,096. The quantity of gas accounted for during the year was 3,941,306 therms, being equivalent to 821,105,000 c.ft. This is an increase of 68,666 therms, or 14,305,000 c.ft., over the previous year.

PROPOSED COKE OVEN PLANT AT LEEDS.

Ministry of Health Inquiry into a Dispute.

A dispute between the Leeds Corporation, on the one hand, and Lord Irwin (Viceroy of India) and the Waterloo Main Colliery Company, Ltd., on the other, was the subject of a Ministry of Health inquiry at Leeds on Feb. 8, when it was said that the Corporation had created a Gilbertian situation by pressing the Colliery Company to supply gas from coke ovens which the Corporation themselves had refused permission to erect. The Right Hon. H. P. MACMILLAN, K.C., said that in 1912 Lord Irwin (then Mr. Edward Wood) granted to the Waterloo Colliery the lease of a number of seams of coal, ironstone, and clay under the Templenewsam Estate. That lease covered minerals under about 3000 acres; and provision was made for the construction of coke ovens at Thorpe Stapleton. Negotiations continued for a number of years, but at the end of 1927, said Counsel, it was astonishing to see the *volte-face* which took place. Following two letters from the Town Clerk, the Corporation stated that the whole scheme had fallen through.

The situation, said Counsel, could then only be described as Gilbertian, for the Corporation began to press for the gas to be supplied according to the previous contract from the very ovens which they were barring the Company from building.

The objections, he understood, were due to fear of injury of the Templenewsam property and to the Killingbeck housing scheme. The mansion at Templenewsam, however, was over two miles away from the proposed site of the plant, and the housing estate was a mile and a half distant. If the ovens were not built, the city would be deprived of 1½ to 2 million c.ft. of gas every day, and the bar would also prevent the employment of a large number of men in this coalfield and a substantial number in the coke oven industry.

Mr. W. J. JEEVES (for the Corporation), addressing the Inspector, said that he hoped the good relations which had always existed between the Corporation and Lord Irwin would not be disturbed by these proceedings. The point was: Was this an area on which coke ovens should be erected? The Corporation were anxious to do everything possible to develop industry in the city, and unless they had considered that the erection of ovens there would be detrimental to the best interests, they would not have refused their consent. The Council had turned the matter down with real reluctance. There had been comment on the Corporation's change of mind on the matter; but it was better, he urged, when a mistake had been made, that it should be recognized. At the same time, if after the evidence which had been furnished at the inquiry the Ministry found that the coke ovens could be safely erected in the area, no one would welcome that more than the Corporation. If the ovens were erected in the near future they were prepared to continue the agreement to take gas from that source.

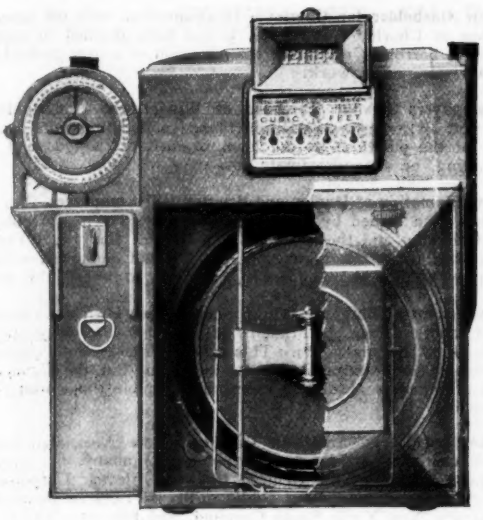
The inquiry then closed.

"AN ARCHITECTURAL GASOMETER."

This is the title of an article written by the Editor of "Specification," and which recently appeared in that periodical. The following is an extract:

It is recorded that when, in 1814, the general lighting of London by coal gas was inaugurated, the scheme was much ridiculed by the scientists of the day, and that Sir Humphry Davy, then President of the Royal Society, asked if it were intended to convert the dome of St. Paul's into a gasometer! Æsthetically speaking, it is perhaps to be regretted that the design of the gasometer could not have been based on so shapely a model, instead of assuming the form with which the public has become familiar for over a hundred years. Within the last decade, however, an entirely new principle of construction has been applied to the design of gasometers—or gasholders, as they are more correctly called—and the improvement in their appearance which has resulted from the change is sufficiently marked to justify the hope that this recently developed form will be universally adopted.

The writer of this article makes no excuse for the appeal which the new type of holder made to him, and does not consider any apology is necessary for describing it as an architectural one. The new gasholder appeared to combine the beauty of line and form so often associated with a windmill—which impression was due to the horizontal ribs around the holder—and also suggested a lighthouse, because of its appearance of stability and the range of windows encircling its topmost stage. However unacceptable these resemblances may be to some, it was evident that a great deal of ingenuity and imagination had been brought to bear upon the design of the structure, and this reflection was in itself a satisfying one. . . . By great good fortune the new gasholder possesses a definite æsthetic quality. This satisfactory outcome is largely due to the sound judgment the designers have shown in solving the numerous and varied problems presented to them, and their logical reception of influences which were induced by novel conditions.



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COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market continues to enjoy considerable activity for all kinds of coal, and the movement, if anything, is gaining strength. It must not be forgotten that output can be increased readily enough, and no doubt idle seams and collieries will be brought into production if the present demand is sustained, so that any great increase upon current prices is unlikely. At the same time, the present much improved trade is giving great satisfaction, and work all round is more regular than for a long time past.

Screened steam coals are in chief demand, and all Northumberland collieries are able to sell their outputs of this kind for weeks ahead. A very satisfactory feature has been an improved demand from Scandinavia, where so much trade was lost to Poland after the strike. Coking coals have also come into renewed active demand, and gas sorts have an improving tendency, especially for forward contracts.

Wear Special gas makes are quoted at 15s. 3d. to 15s. 6d. f.o.b., and best qualities are 15s. Second-class gas ask 14s. 3d. to 14s. 6d., which is a considerable advance. Unscreened coking is very scarce for early shipment, and 15s. to 15s. 3d. is the value for best qualities, while seconds ask 14s. 6d. at least. Ordinary Durham bunkers quote 14s. to 14s. 6d., and best sorts are heavily sold, and unobtainable below 15s. Good business is being done well into March, and inquiries are being received for longer periods.

Gas coke is lacking in interest, and there are no signs of any move. The quotation for shipment remains at 18s. 6d. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas coals are being tentatively spoken of in respect of forward business; but the position appears to be rather uncertain in view of the probable outputs under recent restrictions, together with what the quotas will be at a later date. Collieries are looking forward to increased figures for all descriptions of coal to non-productive works, and it is a matter of opinion whether these will be realized.

Industrial fuel is not moving quite so freely in regard to new business, and recent figures have been averaged, with concessions in some instances.

Export demands increase. The position in this respect is rather better than it was last week, although difficulties are experienced in respect of prompt supplies of South Yorkshire hards and in some cases bunker coal. There is, however, a general feeling of improvement, which must of necessity be gradual.

The demand for domestic coal has not been quite up to last week's standard, although deliveries have been fairly satisfactory, especially for secondary and bagging qualities. In some cases collieries are a few weeks behind in deliveries, but, generally speaking, the average execution of orders is fairly reasonable.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire—Hards, Association, bunkers 19s. 9d. to 20s. 3d., export 16s. 9d. to 17s.; screened gas coal, export 16s. 6d. to 16s. 9d.; washed trebles, export 16s. 9d. to 17s.; washed doubles, bunkers 18s. 3d., export 15s. 9d. to 16s. 3d.; washed singles, export 14s. 9d. to 15s. 3d.; washed smalls, bunkers 14s. 9d., export 11s. 9d. to 12s. 6d.; rough slack, bunkers 12s. 6d. to 13s., export 10s. to 10s. 6d.; smithy peas, export 17s. to 18s.

West Yorkshire—Hartley's (f.o.b. Goole), bunkers 17s. 3d. to 17s. 9d., export 15s. 6d. to 16s.; screened gas coal, export 15s. 6d. to 16s.; washed trebles, export 16s. to 16s. 6d.; washed doubles, export 15s. to 15s. 6d.; washed singles, export 13s. 9d. to 14s. 3d.; washed smalls, bunkers 13s. 6d. to 14s., export 11s. to 11s. 3d.; unwashed trebles, export 15s. 9d. to 16s.; unwashed doubles, export 13s. to 13s. 6d.; rough slack, export 9s. 3d. to 9s. 6d.; coking smalls, export 8s. 6d. to 9s. 6d.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 9d. to 20s. 3d., export 16s. 9d. to 17s.; cobbles, export 16s. to 16s. 6d.; washed trebles, export 16s. to 17s.; washed doubles, export 15s. to 15s. 6d.; washed singles, export 14s. to 14s. 6d.; washed smalls, bunkers 14s. 9d., export 11s. 6d. to 11s. 9d.; unwashed doubles, export 13s. 6d. to 14s. 3d.; rough slack, bunkers 13s. to 13s. 6d., export 10s. to 10s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. 6d. to 18s., export 14s. to 15s.; gas coke, export 18s. 6d. to 22s.; furnace coke, export 19s. to 19s. 6d.; washed steam, Goole (West Yorks.), bunkers 17s. 6d.; Hull (West Yorks.), bunkers 18s.; Hull (South Yorks.), bunkers 18s., export 15s. to 15s. 6d.

MIDLANDS.

Market conditions have been strengthened. If there has been no very material increase in the price level, advances announced earlier have been made effective, and there has been less irregularity. Pits within the restriction scheme are marketing their full quota. Those outside are making capacity output.

An improving demand, combined with the freer competitive terms on which exporters have been put by the rebate on freights, has tended to relieve the tension in non-exporting districts, leaving them a larger home market for exploitation. Yorkshire, Derbyshire, and Nottinghamshire collieries have been able to get rather better prices for their slacks, with the result of checking forced sales elsewhere. A few spot lots are still being offered from time to time, but not enough to disorganize business. Considerable consignments of "D.S." nuts have been going to the London market from the Warwickshire district.

Symptoms of a broadening demand for some descriptions of industrial fuel are becoming rather more clearly defined. Blast-furnace coke can be bought round 13s. at ovens; but the indications are that suppliers are gradually getting a firmer grip of the market with the closer control of output. It is understood that two additional blast-furnaces are to be re-started in the Midlands.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 11.

Tar products continue without material change.

Business in pitch is reported at between 35s. and 36s. per ton; but there is little animation about the market.

Creosote is about 6¾d. to 7d. per gallon.

Tar spirits are steady; pure benzole being 1s. 9d. to 1s. 10d. per gallon; pure toluole, 1s. 11d. to 2s. per gallon; and 95/160 solvent naphtha, 1s. 5d. to 1s. 6d. per gallon.

Pyridine is about 4s. 3d. per gallon.

Tar Products in the Provinces.

Feb. 11.

All markets are unchanged, and prices generally are maintained.

The average prices of gas-works products during the week were: Gas-works tar, 22s. to 27s. Pitch—East Coast, 35s. to 36s. f.o.b. West Coast—Manchester, 30s. to 30s. 6d.; Liverpool, 32s. to 33s.; Clyde, 32s. to 33s. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 4⅝d. to 4⅞d.; salty, 4½d. to 4⅝d.; Scotland, 4½d. to 4⅝d. Heavy oils, in bulk, North, 8½d. to 8¾d. Carbolic acid, 60 p.ct., 1s. 10d. to 1s. 11d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct. purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 10½	per gallon at works
Motor ,, . . .	1 4	,,	1 4½	,, ,, ,,
90 p.ct. ,, . . .	1 7	,,	1 8	,, ,, ,,
Pure ,, . . .	1 10	,,	1 11	,, ,, ,,

TRADE NOTES.

New Purifier House for Bradford.

The Bradford Corporation Gas Committee have accepted the tender of Messrs. Goodall, Clayton, & Co., Ltd. (Leeds), to erect the new purifier house at the Birkshall Gas-Works.

Resetting of Retorts at Halifax.

The Halifax Corporation Gas Committee have accepted the tender of Messrs. W. H. Sismay & Co., Carbonizing Engineers, of Powell Street, Halifax, for the resetting of two through beds of retorts at the gas-works.

CONTRACTS OPEN.

Coal Carbonizing and Handling Plants.

The Sutton-in-Ashfield Urban District Council invite tenders for extensions to their existing coal carbonizing and handling plants. [See advert. on p. 439.]

Exhauster.

Tenders are invited by the Plymouth Gas Committee for the supply, delivery, and erection of an exhauster. [See advert. on p. 438.]

Mantles.

The City of Plymouth invite tenders for the supply of gas mantles. [See advert. on p. 438.]

Extensions at Walsall.—The Walsall Corporation Gas Committee propose to apply to the Ministry of Health for sanction to a loan of £22,000 to meet past and prospective expenditure in connection with meters and extension of mains. The Committee also propose to spend, out of revenue, £600 on the provision of slipper baths at the gas-works.

Gas Preferred to Electricity.—The Bonsall Urban District Council have decided to embark on a gas lighting scheme for their area in preference to electricity; and the offer of the Matlock Council has been accepted, providing that they will supply gas at a cheaper rate than that charged to private consumers, and conditional on the work being completed within one month of the order being placed.

Inverkip Householders Want Gas.—A petition signed by practically all the householders in Inverkip has been received by the Greenock Corporation asking that a supply of gas should be given to the village. Until a few weeks ago gas was available for Inverkip from a private plant belonging to the Ardgowan estate, but this plant has been replaced by an electricity installation, and the gas supply has been discontinued. Meantime the householders in Inverkip have to resort to oil lamps and candles. The petition has been considered by the Greenock Corporation Gas Committee, and the Gas Manager has been instructed to prepare a report on the matter.

Meter Testing at Leeds.—A report of gas meter testing at Leeds during the past year states that of the 32,411 meters tested at the City Justices' testing station, 1340 were rejected.

New Gasholder for Chorley.—In connection with the scheme of extension at Chorley Gas-Works, it has been decided to apply for sanction to borrow £18,334 for the provision of a new gasholder and necessary excavation work.

Ratepayers Favour Purchase of Windermere Undertaking.—A recent poll of ratepayers at Windermere resulted in a vote of 866 in favour of the purchase by the local Council of the gas and water undertaking, at an approximate cost of £100,000.

Amalgamation of Dudley and Brierley Hill Companies.—An agreement has been signed by the Directors of the Town of Dudley Gas Light Company and the Brierley Hill District Gas Light Company with a view to an amalgamation of the two Companies, subject to the approval of the shareholders at a meeting to be held this month.

Extensions at Bingley.—The Bingley Urban District Council have secured sanction from the Ministry of Health to borrow £44,503 for extensions to the gas-works. This scheme was strongly opposed by a section of the community at its inception, but the Council contended that it was absolutely essential to enable the works to meet the growing load.

Proposed Large American Combine.—The Associated Gas and Electric Company, of America, a holding Company, has contracted to acquire control of the General Gas and Electric Corporation, a holding Company controlling public utility services in Pennsylvania, New Jersey, New York, South Carolina, and Florida. The resulting Corporation will have gross earnings of 70 million dollars per year.

Low-Temperature Carbonization at Thorne Moorends.—The establishment of a second installation in the Doncaster colliery area for the extraction of crude oil from coal by means of low-temperature carbonization is contemplated at Thorne Moorends. The other is being built at Askern. A site of 40 acres near Thorne Colliery has been purchased, and it is expected that the erection of the plant will proceed without delay. When finished it is estimated that 100 people will be employed.

Gas for Bolton Baths.—The Bradford Corporation Baths Committee have agreed to experiment in heating entirely by gas at the Bolton district baths. The experiment is the outcome of strong advocacy by Councillor F. J. Cowie, Deputy Chairman of the Bradford Corporation Gas Committee; and if it proves successful, it is likely that gas heating may be installed at other baths, as well as at schools. It is asserted that where heat is only needed intermittently gas is likely to prove more economical than coal heating.

Glasgow Lighting Department Report.—The continued extensive building by the Corporation Housing Department, and the consequent laying-out of numerous new streets, caused the installation of many new street lamps of which over 900 additional were lit. Much work in the installation of new street lamps was also caused by the formation of new streets at housing schemes built by private enterprise. One firm alone is responsible for most of this additional mileage, where nearly 250 further lamps were lit. The total number of public lamps—gas and electric—increased from 29,920 at May 31, 1927, to 31,164 at May 31, 1928, and the total number of lights—gas and electric—in common stairs from 87,037 to 87,457. The mileage of streets lit increased from approximately 549 miles at May 31, 1927, to approximately 572 miles at May 31, 1928.

Gas in Barbados.—The following advertisement, giving some idea of the progress of the gas industry in Barbados, appeared in the "Barbados Advocate" for Jan. 23, on behalf of the Barbados Gas Company, Ltd.: Gas for cooking is the cleanest, cheapest, and quickest method known in Barbados. . . . All cooking by any method is a known quantity of heat units consumed, whether coal, wood, oil, electricity, or gas. The cheapest electricity offer made in Barbados for all purposes is, assuming 100 units containing 342,000 units of heat, $4.00, *plus* a minimum fixed charge of $1.00, a total of $5.00, whereas 1000 c.ft. of gas contains over 400,000 units of heat—$2.40, *plus* meter rental of $0.12, making a total of $2.52. When electricity is 2c. per unit, gas will still lead the way and be cheaper. . . . In Barbados to-day more people cook their daily food by gas than in the whole of the other British West Indian Islands.

By Messrs. F. C. Sugden & Co., Ltd., 10, East Parade, Leeds, we have been presented with an excellent refill notebook.

Blackburn Corporation Gas Committee have authorized tenders for a telpherage system required at the Greenbank Gas-Works. Mr. G. P. Mitchell, Gas Engineer, reported on the appointment of a District Committee (of which he is a member) in connection with the investigations now being made by the Board of Trade respecting the technical and economic aspects of an area gas supply system.

The January issue of "A Thousand-and-One Uses for Gas" contains a very interesting article on modern gas lighting excellently illustrated by photographs of a few of the beautiful gas lighting fittings which are now available for home lighting. Included also are photographic examples of good gas lighting results in workshops and factories, together with some fine illumination effects in offices and halls by means of standard and pendant lamps.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Feb. 8.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	70–75*	–2	77
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	73–76*	..	..
1,551,868	,,	Sept. 27	7	7⅛	Alliance & Dublin Ord.	99–102	..	100–101
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	63–66	..	66
522,654	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	114–117	..	115½
800,000	1	Oct 11	1/7½	1/8⅛	Bombay, Ltd.	20/–22/-	..	..
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	12½–13½	+½	13
500,050	10	,,	7	7	Do. B 7 p.c.	12½–13	..	12½–13½
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11–11½	..	11½
50,000	Stk.	Jan. 10	3	3	Do. 5 p.c. Deb.	55–58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	74–77	..	..
857,900	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	115–118	..	..
341,880	,,	,,	6½	6½	Do. 5 p.c. Con.	101–104	..	..
1,387,500	,,	July 26	5	5	Bristol 5 p.c. max.	93½–94½a	..	..
885,000	,,	Sept. 27	7	8	British Ord.	116–119	+1	117–118
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	115–120	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73–76	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	93–96	..	..
100,000	10	Dec. 6	8	6	Cape Town, Ltd	8–9	..	..
100,000	10	Oct 25	4½	4½	Do. 4½ p.c. Pref.	6½–7½	..	..
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	73–78	..	..
626,860	,,	July 26	6	6	Cardiff Con. Ord.	97–100	..	..
237,860	,,	Jan. 10	7½	7½	Do. 7½ p.c. Red. Deb.	98–101	..	..
157,150	,,	Aug 16	6½	5	Chester 5 p.c. Ord.	90–95b	..	..
79,185	1	Oct. 11	12/-	12/-	Colombo Ltd. Ord.	36/–38/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	21/–23/-	..	..
375,402	1	Oct. 11	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	24/6–26/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref	21/–23/-	..	..
2,073,280	Stk.	July 26	7	5	Commercial Ord.	100–103	..	100–102
475,000	,,	Dec. 20	8	8	Do 8 p.c. Deb.	56–59	..	58
800,000	,,	Sept. 27	11	11	Continental Union, Ltd.	117–122	–1	117–120
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	118–123	..	117½–118
787,560	,,	Aug. 16	7	7	Croydon sliding scale	111–114	..	..
403,100	,,	,,	5	5	Do. max. div.	84–87	..	87
492,270	,,	Aug 16	10	7	Derby Con.	115–120e	..	..
55,000	,,	Dec. 20	4	4	Do. Deb.	70–72e	..	..
209,000	,,	Aug 30	5	5	East Hull Ord. 5 p.c.	75–78	..	..
1,002,180	10	Sept. 13	16	14	European, Ltd.	15 17	..	16½–17
19,704,480	Stk.	July 26	5/1/4	5½	Gas Light & Coke 4 p.c. Ord	19/9–20/3	–/3	19 6–20/6
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	65–67	..	67½–67½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	79–82	..	80–80½
5,602,620	,,	Dec. 20	3	3	Do. 3 p.c. Con. Deb.	59–61	..	60½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db	102–105	..	..
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98–101	..	101–101½
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 30	6½	7	Hastings & St L. 5 p.c. Cons	95–100	..	..
258,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	75–80	..	..
70,000	10	Oct 11	10	110	Hongkong & China, Ltd.	13 14	..	..
178,200	Stk.	Aug 30	5	5½	Hornsey Con. 5½ p.c.	88–91	..	90
1,976,000	,,	Nov. 8	10	10	Imperial Continental Cap	400–420	+60	345–417
228,180	,,	Feb 7	8½	8½	Do. 8½ p.c. Red. Deb.	69–72*	–1	..
285,242	,,	Aug 16	7	7½	Lea Bridge 6 p.c. Ord.	120–123	..	..
2,145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord.	91–95b	..	..
600,000	,,	Sept 27	7	7	Do. 7 p.c. Red. Pref.	101–103b	..	..
166,786	,,	Aug. 16	8	9	Maidstone 5 p.c. Cap.	124–129	..	127–129
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54–57	..	..
75,000	5	Dec. 6	18	18	Malta & Mediterranean	5¾–6½	+¼	..
392,000	—	—	—	—	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb.	100–102	..	101½
541,920	Stk.	Nov. 22	17	15	Montevideo, Ltd.	97–100	..	..
2,061,818	,,	Aug. 16	5	5	Newcastle & Gateshead Con	17/6–18/-d	–/3	..
682,876	,,	,,	4	4	Do. 4 p.c. Pref.	74–75d	+½	..
691,705	,,	Dec. 20	8½	8½	Do. 8½ p.c. Deb.	68 69d	..	..
131,780	,,	Aug 30	3/18/0	7/1.0	North Middlesex 6 p.c. Con	102–107	..	..
300,000	,,	Nov. 22	7	9	Oriental, Ltd.	116–120	+8½	120
188,120	,,	Dec. 20	7½	8	Plym'th & Stonehouse 5 p.c	108–111	..	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4 p.c. Std	115–120	+7	116
286,782	,,	,,	5	5	Do. 5 p.c. max	83 86	+3	83½
3,334,464	1	—	—	—	Primitiva Ord.	26.6–28.6	..	27/–27/9
244,500	100	Dec. 3	4	4	Do. 4 p.c. Red. Deb.	91–94	..	..
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	78–80*	..	..
416,345	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	78–80	..	79½
150,000	10	Sept 27	6	6	San Paulo 6 p.c. Pref.	8⅞–8¾	..	..
1,736,968	Stk.	Aug. 30	—	—	Sheffield Cons.	105–107e	..	..
95,000	,,	Jan. 10	—	—	Do 4 p.c. Deb.	74–77e	..	..
90,000	10	June 14	13	14	South African	4–6	..	..
6,609,845	Stk.	July 26	7½	5	South Met. Ord.	108 110	..	108½–110
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110–113	..	112
1,895,445	,,	Jan. 10	3	3	Do. 3 p.c. Deb.	59–61	..	59–61
734,000	,,	Sept 13	6½	6½	Do. 6½ p.c. Red. Db.	101–103	..	101½
91,500	,,	Aug. 16	8½	8½	South Shields Con.	109–110d	..	..
1,543,795	,,	July 26	6½	6½	South Suburban Ord. 5 p.c.	109–112	..	109½
468,837	,,	Dec. 10	5	5	Do. 5 p.c. Deb.	98–101	..	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max	77 79	..	..
121,275	,,	Dec. 10	4	4	Do. 4 p.c. Deb	72–75	..	..
250,000	,,	Aug 30	7	7	Swansea 7 p.c. Red. Pref.	101–103	..	..
200,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	99–101	..	..
1,004,275	,,	—	—	—	Tottenham District Ord.	101–104	..	..
150,000	,,	July 29	5½	5½	Do. 5½ p.c. Pref.	97–100	+1	..
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75–78	..	78
289,094	,,	Aug. 30	6.5/16	6⅞	Uxbridge, Maidenhead, & Wycombe 5 p.c.	98–98	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	87–92	..	..
80,000	,,	July 12	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	145–150	+15	..
255,686	,,	,,	7	7½	Do. B 8½ p.c.	127–132	+12	130–130½
432,585	,,	,,	5/19/0	6½	Do. C and New	103–108	+4	..
352,000	,,	,,	6⅞	6⅞	Do. Wimbledon 5 p.c.	117–122	+9	..
98 030	,,	,,	7½	7½	Do. Epsom 5 p.c.	130–135	+13	133½–134
200,000	,,	,,	5	5	Do. 5 p.c. Pref	90–95	..	..
88 416	,,	Dec. 20	8	8	Do. 8 p.c. Deb.	57–60	..	..
284,748	,,	,,	4	4	Do. 4 p.c. Deb.	77–80	..	..
297,500	,,	,,	5	5	Do. 5 p.c. Deb.	97–100	..	..

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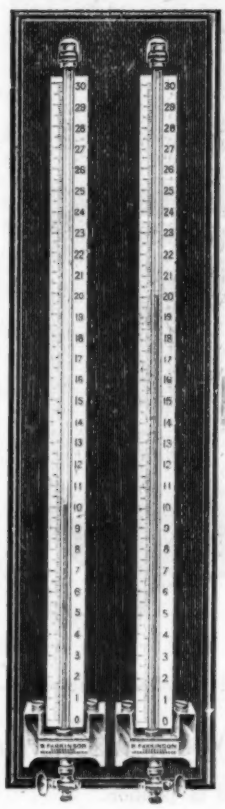

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